



# Assignment

## Properties of Integration, fundamental Integration formulae

### Basic Level

1.  $\int \sec x \, dx =$  [MP PET 1988,95; Rajasthan PET 1996]  
 (a)  $\log \tan\left(\frac{\pi}{4} - \frac{x}{2}\right) + c$  (b)  $\log(\sec x - \tan x) + c$  (c)  $\log\left(\frac{\pi}{4} + x\right) + c$  (d)  $\log(\sec x + \tan x) + c$
2.  $\int 5 \sin x \, dx =$  [MP PET 1988]  
 (a)  $5 \cos x + c$  (b)  $-5 \cos x + c$  (c)  $5 \sin x + c$  (d)  $-5 \sin x + c$
3.  $\int (\sec x + \tan x)^2 \, dx =$  [MP PET 1987, 92]  
 (a)  $2(\sec x + \tan x) - x + c$  (b)  $\frac{1}{3}(\sec x + \tan x)^3 + c$  (c)  $\sec x(\sec x + \tan x) + c$  (d)  $2(\sec x + \tan x) + c$
4.  $\int \operatorname{cosec}^2 x \, dx$  is equal to [MP PET 1999]  
 (a)  $\cot x + C$  (b)  $-\cot x + C$  (c)  $\tan^2 x + C$  (d)  $-\cot^2 x + C$
5.  $\int \sec x \tan x \, dx =$  [Rajasthan PET 2003]  
 (a)  $\sec x + \tan x + C$  (b)  $\sec x + C$  (c)  $\tan x + C$  (d)  $-\sec x + C$
6.  $\int \frac{\sin x + \cos x}{\sqrt{1 + \sin 2x}} \, dx =$  [MP PET 1990]  
 (a)  $\sin x + c$  (b)  $\cos x + c$  (c)  $x + c$  (d)  $x^2 + c$
7.  $\int (3 \operatorname{cosec}^2 x + 2 \sin 3x) \, dx =$  [AI CBSE 1981]  
 (a)  $3 \cot x + \frac{2}{3} \cos 3x + c$  (b)  $-\left(3 \cot x + \frac{2}{3} \cos 3x\right) + c$  (c)  $3 \cot x - \frac{2}{3} \cos 3x + c$  (d) None of these
8.  $\int \frac{1 + \cos^2 x}{\sin^2 x} \, dx =$  [MP PET 1993; Ranchi BIT 1982]  
 (a)  $-\cot x - 2x + c$  (b)  $-2 \cot x - 2x + c$  (c)  $-2 \cot x - x + c$  (d)  $-2 \cot x + x + c$
9. The value of  $\int \cot x \, dx$  is [Rajasthan PET 1995]  
 (a)  $\log \cos x + c$  (b)  $\log \tan x + c$  (c)  $\log \sin x + c$  (d)  $\log \sec x + c$
10. The value of  $\int \frac{1}{(x-5)^2} \, dx$  is  
 (a)  $\frac{1}{x-5} + c$  (b)  $-\frac{1}{x-5} + c$  (c)  $\frac{2}{(x-5)^3} + c$  (d)  $-2(x-5)^3 + c$

11.  $\int \frac{x^2}{x^2 + 4} dx$  equals to [Rajasthan PET 2001]  
 (a)  $x - 2 \tan^{-1}(x/2) + c$  (b)  $x + 2 \tan^{-1}(x/2) + c$  (c)  $x - 4 \tan^{-1}(x/2) + c$  (d)  $x + 4 \tan^{-1}(x/2) + c$
12.  $\int x^2 \sec x^3 dx =$  [MNR 1986; Roorkee 1975]  
 (a)  $\log(\sec x^3 + \tan x^3)$  (b)  $3(\sec x^3 + \tan x^3)$  (c)  $\frac{1}{3} \log(\sec x^3 + \tan x^3)$  (d) None of these
13.  $\int \frac{\cos 2x - 1}{\cos 2x + 1} dx =$  [MP PET 2000]  
 (a)  $\tan x - x + c$  (b)  $x + \tan x + c$  (c)  $x - \tan x + c$  (d)  $-x - \cot x + c$
14.  $\int \sin^{-1}(\cos x) dx =$   
 (a)  $\frac{\pi x}{2}$  (b)  $\frac{\pi x^2}{2}$  (c)  $\frac{\pi x - x^2}{2}$  (d)  $\frac{\pi x + x^2}{2}$
15.  $\int (\sin^{-1} x + \cos^{-1} x) dx =$  [MP PET 1990]  
 (a)  $\frac{1}{2} \pi x + c$  (b)  $x(\sin^{-1} x - \cos^{-1} x) + c$  (c)  $x(\cos^{-1} x + \sin^{-1} x) + c$  (d)  $\frac{\pi}{2} + x + c$
16.  $\int x^{51} (\tan^{-1} x + \cot^{-1} x) dx =$  [MP PET 1991]  
 (a)  $\frac{x^{52}}{52} (\tan^{-1} x + \cot^{-1} x) + c$  (b)  $\frac{x^{52}}{52} (\tan^{-1} x - \cot^{-1} x) + c$   
 (c)  $\frac{\pi x^{52}}{104} + \frac{\pi}{2} + c$  (d)  $\frac{\pi x^{52}}{52} + \frac{\pi}{2} + c$
17. The value of  $\int \frac{1}{x^4} dx$  is [Rajasthan PET 1995]  
 (a)  $\frac{1}{-3x^3} + c$  (b)  $\frac{1}{3x^3} + c$  (c)  $\frac{1}{-4x^3} + c$  (d)  $-\frac{1}{3x^3} + c$
18.  $\int a^x dx =$  [Rajasthan PET 2003]  
 (a)  $\frac{a^x}{\log a} + C$  (b)  $a^x \log a + C$  (c)  $\log a + c$  (d)  $a^x + C$
19.  $\int a^x da =$  [MP PET 1994, 96]  
 (a)  $\frac{a^x}{\log_e a} + C$  (b)  $a^x \log_e a + C$  (c)  $\frac{a^x}{x+1} + C$  (d) None of these
20.  $\int 13^x dx =$  [Kerala (Engg.) 2002]  
 (a)  $\frac{13^x}{\log 13} + C$  (b)  $13^{x+1} + C$  (c)  $14x + C$  (d)  $14^{x+1} + C$
21.  $\int e^{x \log a} \cdot e^x dx$  is equal to  
 (a)  $(ae)^x$  (b)  $\frac{(ae)^x}{\log(ae)}$  (c)  $\frac{e^x}{1 + \log a}$  (d) None of these

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22.  $\int a^{3x+3} dx =$  [Roorkee 1977]  
 (a)  $\frac{a^{3x+3}}{\log a} + c$  (b)  $\frac{a^{3x+3}}{3 \log a} + c$  (c)  $a^{3x+3} \log a + c$  (d)  $3a^{3x+3} \log a + c$
23.  $\int e^{\log(\sin x)} dx =$  [MP PET 1995]  
 (a)  $\sin x + c$  (b)  $-\cos x + c$  (c)  $e^{\log \cos x} + c$  (d) None of these
24. The value of  $\int e^{m \log x} dx$  is  
 (a)  $\frac{x^{m+1}}{m+1} + k$  (b)  $\frac{e^{m \log x}}{m} + k$  (c)  $\frac{e^m}{\log x} + k$  (d)  $\frac{e^m}{x} + k$
25.  $\int \frac{e^{5 \log x} - e^{4 \log x}}{e^{3 \log x} - e^{2 \log x}} dx =$  [MNR 1985]  
 (a)  $e \cdot 3^{-3x} + c$  (b)  $e^3 \log x + c$  (c)  $\frac{x^3}{3} + c$  (d) None of these
26. If  $f'(x) = \frac{1}{x} + x$  and  $f(1) = \frac{5}{2}$ , then  $f(x) =$   
 (a)  $\log x + \frac{x^2}{2} + 2$  (b)  $\log x + \frac{x^2}{2} + 1$  (c)  $\log x - \frac{x^2}{2} + 2$  (d)  $\log x - \frac{x^2}{2} + 1$
27.  $\int \sqrt{1 + \sin x} dx =$  [MP PET 1995]  
 (a)  $\frac{1}{2} \left( \sin \frac{x}{2} + \cos \frac{x}{2} \right) + c$  (b)  $\frac{1}{2} \left( \sin \frac{x}{2} - \cos \frac{x}{2} \right) + c$  (c)  $2\sqrt{1 + \sin x} + c$  (d)  $-2\sqrt{1 - \sin x} + c$
28.  $\int \sqrt{1 + \sin \frac{x}{2}} dx =$  [IIT 1980; MP PET 1989]  
 (a)  $\frac{1}{4} \left( \cos \frac{x}{4} - \sin \frac{x}{4} \right) + c$  (b)  $4 \left( \cos \frac{x}{4} - \sin \frac{x}{4} \right) + c$  (c)  $4 \left( \sin \frac{x}{4} - \cos \frac{x}{4} \right) + c$  (d)  $4 \left( \sin \frac{x}{4} + \cos \frac{x}{4} \right) + c$
29.  $\int \sqrt{1 - \sin 2x} dx = \dots\dots\dots, x \in (0, \pi/4)$  [MP PET 1987]  
 (a)  $-\sin x + \cos x$  (b)  $\sin x - \cos x$  (c)  $\tan x + \sec x$  (d)  $\sin x + \cos x$
30.  $\int \frac{dx}{1 - \sin x} =$  [MP PET 1991]  
 (a)  $x + \cos x + c$  (b)  $1 + \sin x + c$  (c)  $\sec x - \tan x + c$  (d)  $\sec x + \tan x + c$
31.  $\int \frac{\cos x - 1}{\cos x + 1} dx =$  [MP PET 1989, 92]  
 (a)  $2 \tan \frac{x}{2} - x + c$  (b)  $\frac{1}{2} \tan \frac{x}{2} - x + c$  (c)  $x - \frac{1}{2} \tan \frac{x}{2} + c$  (d)  $x - 2 \tan \frac{x}{2} + c$
32.  $\int \sqrt{1 + \cos x} dx$  equals [Rajasthan PET 1996]  
 (a)  $2\sqrt{2} \sin \frac{x}{2} + c$  (b)  $-2\sqrt{2} \sin \frac{x}{2} + c$  (c)  $-2\sqrt{2} \cos \frac{x}{2} + c$  (d)  $2\sqrt{2} \cos \frac{x}{2} + c$
33.  $\int \frac{dx}{\sqrt{x} + \sqrt{x-2}} =$  [MP PET 1990]  
 (a)  $\frac{1}{3} [x^{3/2} - (x-2)^{3/2}] + c$  (b)  $\frac{2}{3} [x^{3/2} - (x-2)^{3/2}] + c$  (c)  $\frac{1}{3} [(x-2)^{3/2} - x^{3/2}] + c$  (d)  $\frac{2}{3} [(x-2)^{3/2} - x^{3/2}] + c$

34.  $\int \frac{dx}{\sqrt{x+a} + \sqrt{x+b}} =$  [AISSE 1989]
- (a)  $\frac{2}{3(b-a)}[(x+a)^{3/2} - (x+b)^{3/2}] + c$  (b)  $\frac{2}{3(a-b)}[(x+a)^{3/2} - (x+b)^{3/2}] + c$
- (c)  $\frac{2}{3(a-b)}[(x+a)^{3/2} + (x+b)^{3/2}] + c$  (d) None of these
35.  $\int \frac{3x^3 - 2\sqrt{x}}{x} dx =$  [Roorkee 1976]
- (a)  $x^3 - \sqrt{x} + c$  (b)  $x^3 + \sqrt{x} + c$  (c)  $x^3 - 2\sqrt{x} + c$  (d)  $x^3 - 4\sqrt{x} + c$
36.  $\int \frac{5(x^6 + 1)}{x^2 + 1} dx =$
- (a)  $5(x^7 + x)\tan^{-1} x + c$  (b)  $x^5 - \frac{5}{3}x^3 + 5x + c$
- (c)  $3x^4 - 5x^2 + 15x + c$  (d)  $5\tan^{-1}(x^2 - 1) + \log(x^2 + 1) + c$
37.  $\int \frac{dx}{\tan x + \cot x} =$  [MP PET 1991]
- (a)  $\frac{\cos 2x}{4} + c$  (b)  $\frac{\sin 2x}{4} + c$  (c)  $-\frac{\sin 2x}{4} + c$  (d)  $-\frac{\cos 2x}{4} + c$
38.  $\int \left(2 \sin x + \frac{1}{x}\right) dx$  is equal to [MP PET 1999]
- (a)  $-2 \cos x + \log x + C$  (b)  $2 \cos x + \log x + C$  (c)  $-2 \sin x - \frac{1}{x^2} + C$  (d)  $-2 \cos x + \frac{1}{x^2} + C$
39.  $\int \sin 2x \cos 3x dx =$  [Roorkee 1976]
- (a)  $\frac{1}{2} \left( \cos x + \frac{1}{5} \cos 5x \right) + c$  (b)  $\frac{1}{2} \left( \cos x - \frac{1}{5} \cos 5x \right) + c$  (c)  $\cos x + \frac{1}{5} \cos 5x + c$  (d)  $\cos x - \frac{1}{5} \cos 5x + c$
40. If  $\int (\sin 2x - \cos 2x) dx = \frac{1}{\sqrt{2}} \sin(2x - a) + b$ , then [Roorkee 1978; MP PET 2001]
- (a)  $a = \frac{\pi}{4}, b = 0$  (b)  $a = -\frac{\pi}{4}, b = 0$  (c)  $a = \frac{5\pi}{4}, b = \text{any constant}$  (d)  $a = -\frac{5\pi}{4}, b = \text{any constant}$
41. If  $\int (\sin 2x + \cos 2x) dx = \frac{1}{\sqrt{2}} \sin(2x - c) + a$ , then the value of a and c is [Roorkee 1978]
- (a)  $c = \frac{\pi}{4}$  and  $a = k$  (an arbitrary constant) (b)  $c = -\frac{\pi}{4}$  and  $a = \frac{\pi}{2}$
- (c)  $c = \frac{\pi}{2}$  and a is an arbitrary constant (d) None of these
42. If  $\int \sin 5x \cos 3x dx = -\frac{\cos 8x}{16} + A$ , then A = [MP PET 1992]
- (a)  $\frac{\sin 2x}{16} + \text{constant}$  (b)  $-\frac{\cos 2x}{4} + \text{constant}$  (c) Constant (d) None of these
43. If  $\int \sqrt{2} \sqrt{1 + \sin x} dx = -4 \cos(ax + b) + C$  then the value of (a, b) is [UPSEAT 2002]
- (a)  $\frac{1}{2}, \frac{\pi}{4}$  (b)  $1, \frac{\pi}{2}$  (c) 1, 1 (d) None of these

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44.  $\int \frac{\sin x + \operatorname{cosec} x}{\tan x} dx =$   
 (a)  $\sin x - \operatorname{cosec} x + c$  (b)  $\operatorname{cosec} x - \sin x + c$  (c)  $\log \tan x + c$  (d)  $\log \cot x + c$
45.  $\int \frac{1}{\sqrt{1 + \sin x}} dx =$  [Rajasthan PET 1996]  
 (a)  $2\sqrt{2} \log \tan\left(\frac{\pi}{8} + \frac{x}{4}\right) + c$  (b)  $\frac{1}{\sqrt{2}} \log \tan\left(\frac{\pi}{8} + \frac{x}{4}\right) + c$  (c)  $\sqrt{2} \log \tan\left(\frac{\pi}{8} + \frac{x}{4}\right) + c$  (d)  $\frac{1}{2\sqrt{2}} \log \tan\left(\frac{\pi}{8} + \frac{x}{4}\right) + c$
46.  $\int \frac{\sin^2 x - \cos^2 x}{\sin^2 x \cos^2 x} dx =$  [MP PET 1996]  
 (a)  $\tan x + \cot x + c$  (b)  $\tan x + \operatorname{cosec} x + c$  (c)  $-\tan x + \cot x + c$  (d)  $\tan x + \sec x + c$
47.  $\int \frac{1 - \tan x}{1 + \tan x} dx =$  [MP PET 1994]  
 (a)  $\log \sec\left(\frac{\pi}{4} - x\right) + c$  (b)  $\log \cos\left(\frac{\pi}{4} + x\right) + c$  (c)  $\log \sin\left(\frac{\pi}{4} + x\right) + c$  (d) None of these
48.  $\int \frac{\cos 2x}{\cos x} dx$  is equal to [Rajasthan PET 1991]  
 (a)  $2 \sin x + \log(\sec x - \tan x) + c$  (b)  $2 \sin x - \log(\sec x - \tan x) + c$   
 (c)  $2 \sin x + \log(\sec x + \tan x) + c$  (d)  $2 \sin x - \log(\sec x + \tan x) + c$
49.  $\int \frac{(1+x)^3}{\sqrt{x}} dx$  equals [Rajasthan PET 1990]  
 (a)  $\frac{2}{7} x^{7/2} + \frac{6}{5} x^{5/2} + 2x^{3/2} + 2x^{1/2} + c$  (b)  $\frac{2}{5} x^{7/2} + 2x^{5/2} + 6x^{3/2} + 2x^{1/2} + c$   
 (c)  $\frac{2}{7} x^{7/2} - \frac{6}{5} x^{5/2} + 2x^{3/2} - 2x^{1/2} + c$  (d) None of these
50.  $\int \frac{dx}{9x^2 - 4} =$   
 (a)  $\frac{1}{12} \log \left| \frac{3x+2}{3x-2} \right| + c$  (b)  $\frac{1}{6} \log \left| \frac{3x+2}{3x-2} \right| + c$  (c)  $\frac{1}{12} \log \left| \frac{3x-2}{3x+2} \right| + c$  (d)  $\frac{1}{6} \log \left| \frac{3x-2}{3x+2} \right| + c$
51.  $\int \frac{dx}{a^2 - x^2}$  is equal to [DCE 2002]  
 (a)  $\frac{1}{a} \tan^{-1}\left(\frac{x}{a}\right)$  (b)  $\frac{1}{2a} \sin\left(\frac{a-x}{a+x}\right)$  (c)  $\frac{1}{2a} \log\left(\frac{a+x}{a-x}\right)$  (d)  $\frac{1}{2a} \log\left(\frac{a-x}{a+x}\right)$
52.  $\int \sqrt{x^2 + a^2} dx$  is equal to [Rajasthan PET 2001]  
 (a)  $\frac{x}{2} \sqrt{x^2 + a^2} - \frac{a^2}{2} \log \{x + \sqrt{x^2 + a^2}\} + C$  (b)  $\frac{x}{2} \sqrt{x^2 + a^2} + \frac{a^2}{2} \log \{x + \sqrt{x^2 + a^2}\} + C$   
 (c)  $\frac{x}{2} \sqrt{x^2 + a^2} - \frac{a^2}{2} \log \{x - \sqrt{x^2 + a^2}\} + C$  (d)  $\frac{x}{2} \sqrt{x^2 + a^2} + \frac{a^2}{2} \log \{x - \sqrt{x^2 + a^2}\} + C$
53.  $\int \frac{dx}{4x^2 + 9} =$  [MP PET 1991; Roorkee 1977; MNR 1974]  
 (a)  $\frac{1}{2} \tan^{-1}\left(\frac{2x}{3}\right) + c$  (b)  $\frac{3}{2} \tan^{-1}\left(\frac{2x}{3}\right) + c$  (c)  $\frac{1}{6} \tan^{-1}\left(\frac{2x}{3}\right) + c$  (d)  $\frac{1}{6} \tan^{-1}\left(\frac{3x}{2}\right) + c$
54.  $\int (x-a)(x-b)(x-c) \dots (x-z) dx$  is equal to  
 (a) Constant (b)  $5c + 5d + x$  (c) 0 (d) None of these

55. If  $f'(x) = \sqrt{x}$  and  $f(1) = 2$ , then  $f(x) =$   
 (a)  $\sqrt{x} + 2$  (b)  $x\sqrt{x} + 2$  (c)  $\frac{3}{2}(x\sqrt{x} + 2)$  (d)  $\frac{2}{3}(x\sqrt{x} + 2)$
56. If  $f(x) = \int x^{m-1} dx$  then  $f^{(m+1)}(x) = 0$ , where  
 (a)  $m$  is a negative integer (b)  $m = 0$  (c)  $m$  is not an integer (d)  $m$  is any real number
57. A primitive of  $|x|$ , when  $x < 0$  is [SCRA 1999]  
 (a)  $\frac{1}{2}x^2 + c$  (b)  $-\frac{1}{2}x^2 + c$  (c)  $x + c$  (d)  $-x + c$
58.  $\int \frac{\operatorname{cosec} \theta - \cot \theta}{\operatorname{cosec} \theta + \cot \theta} d\theta =$   
 (a)  $2\operatorname{cosec} \theta - 2\cot \theta - \theta + c$  (b)  $2\operatorname{cosec} \theta - 2\cot \theta + \theta + c$  (c)  $2\operatorname{cosec} \theta + 2\cot \theta - \theta + c$  (d) None of these
59.  $\int (e^{a \log x} + e^{x \log a}) dx =$   
 (a)  $x^{a+1} + \frac{a^x}{\log a} + c$  (b)  $\frac{x^{a+1}}{a+1} + a^x \log a + c$  (c)  $\frac{x^{a+1}}{a+1} + \frac{a^x}{\log a} + c$  (d) None of these
60.  $\int \frac{dx}{4 \cos^3 2x - 3 \cos 2x} =$   
 (a)  $\frac{1}{3} \log [\sec 6x + \tan 6x] + c$  (b)  $\frac{1}{6} \log [\sec 6x + \tan 6x] + c$  (c)  $\log [\sec 6x + \tan 6x] + c$  (d) None of these

### Advance Level

61.  $\int \frac{dx}{\sin^2 x \cos^2 x} =$  [Roorkee 1976; Rajasthan PET 1991]  
 (a)  $\tan x + \cot x + c$  (b)  $\cot x - \tan x + c$  (c)  $\tan x - \cot x + c$  (d) None of these
62.  $\int \frac{\cos 2x - \cos 2\alpha}{\cos x - \cos \alpha} dx =$  [MP PET 1994]  
 (a)  $2[\sin x + x \cos \alpha] + c$  (b)  $2[\sin x + \sin \alpha] + c$  (c)  $2[-\sin x + x \cos \alpha] + c$  (d)  $-2[\sin x + \sin \alpha] + c$
63.  $\int \frac{\sin^8 x - \cos^8 x}{1 - 2 \sin^2 x \cos^2 x} dx =$  [IIT 1986]  
 (a)  $\sin 2x + c$  (b)  $-\frac{1}{2} \sin 2x + c$  (c)  $\frac{1}{2} \sin 2x + c$  (d)  $-\sin 2x + c$
64.  $\{1 + 2 \tan x (\tan x + \sec x)\}^{1/2}$  [Roorkee 1987]  
 (a)  $\log(\sec x + \tan x) + c$  (b)  $\log(\sec x + \tan x)^{1/2} + c$  (c)  $\log \sec x (\sec x + \tan x) + c$  (d) None of these
65. If  $\int \frac{\cos 4x + 1}{\cot x - \tan x} dx = A \cos 4x + B$ , then  
 (a)  $A = \frac{-1}{2}$  (b)  $A = \frac{-1}{8}$  (c)  $A = \frac{-1}{4}$  (d) None of these
66. If  $x = f''(t) \cos t + f'(t) \sin t$ ,  $y = -f''(t) \sin t + f'(t) \cos t$ , then  $\int \left[ \left( \frac{dx}{dt} \right)^2 + \left( \frac{dy}{dt} \right)^2 \right]^{1/2} dt$  is equal to [SCRA 1999]  
 (a)  $f'(t) + f''(t) + c$  (b)  $f''(t) + f'''(t) + c$  (c)  $f(t) + f''(t) + c$  (d)  $f'(t) - f''(t) + c$

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67. If  $f(0) = f'(0) = 0$  and  $f''(x) = \tan^2 x$  then  $f(x)$  is  
 (a)  $\log \sec x - \frac{1}{2}x^2$  (b)  $\log \cos x + \frac{1}{2}x^2$  (c)  $\log \sec x + \frac{1}{2}x^2$  (d) None of these
68.  $\int \frac{\cos 2x}{(\sin x + \cos x)^2} dx$  is equal to  
 (a)  $\frac{-1}{\sin x + \cos x} + C$  (b)  $\log(\sin x + \cos x) + C$  (c)  $\log(\sin x - \cos x) + C$  (d)  $\log(\sin x + \cos x)^2 + C$
69. If  $\int \frac{\cos^4 x}{\sin^2 x} dx = A \cot x + b \sin 2x + C \frac{x}{2} + D$ , then  
 (a)  $A = -2$  (b)  $B = -1/4$  (c)  $C = -3$  (d) None of these
70.  $\int \frac{\tan x}{\sec x + \tan x} dx =$   
 (a)  $\sec x + \tan x - x + c$  (b)  $\sec x - \tan x + x + c$  (c)  $\sec x + \tan x + x + c$  (d)  $-\sec x - \tan x + x + c$

### Integration by substitution

#### Basic Level

71. A primitive of  $\frac{x}{x^2 + 1}$  is [SCRA 1996]  
 (a)  $\log_e(x^2 + 1)$  (b)  $x \tan^{-1} x$  (c)  $\frac{\log_e(x^2 + 1)}{2}$  (d)  $\frac{1}{2} x \tan^{-1} x$
72. The value of  $\int \frac{x^3}{\sqrt{1+x^4}} dx$  is [SCRA 1996]  
 (a)  $(1+x^4)^{1/2} + c$  (b)  $-(1+x^4)^{1/2} + c$  (c)  $\frac{1}{2}(1+x^4)^{1/2} + c$  (d)  $-\frac{1}{2}(1+x^4)^{1/2} + c$
73.  $\int \sqrt{\frac{1+x}{1-x}} dx =$  [Rajasthan PET 2002]  
 (a)  $-\sin^{-1} x - \sqrt{1-x^2} + c$  (b)  $\sin^{-1} x + \sqrt{1-x^2} + c$  (c)  $\sin^{-1} x - \sqrt{1-x^2} + c$  (d)  $-\sin^{-1} x - \sqrt{x^2-1} + c$
74.  $\int x^x (1 + \log x) dx$  is equal to  
 (a)  $x^x$  (b)  $x^{2x}$  (c)  $x^x \log x$  (d)  $\frac{1}{2}(1 + \log x)^2$
75.  $\int \frac{(x+1)(x+\log x)^2}{x} dx =$  [AI CBSE 1986]  
 (a)  $\frac{1}{3}(x + \log x) + c$  (b)  $\frac{1}{3}(x + \log x)^2 + c$  (c)  $\frac{1}{3}(x + \log x)^3 + c$  (d) None of these
76.  $\int \frac{x^2 + 1}{x(x^2 - 1)} dx$  is equal to [MP PET 1999]  
 (a)  $\log \frac{x^2 - 1}{x} + C$  (b)  $-\log \frac{x^2 - 1}{x} + C$  (c)  $\log \frac{x}{x^2 + 1} + C$  (d)  $-\log \frac{x}{x^2 + 1} + C$

77.  $\int \frac{1}{x^2(x^4+1)^{3/4}} dx =$  [IIT 1984; Rajasthan PET 2000; UPSEAT 2001]  
 (a)  $\frac{(x^4+1)^{1/4}}{x} + c$  (b)  $-\frac{(x^4+1)^{1/4}}{x} + c$  (c)  $\frac{3}{4} \frac{(x^4+1)^{3/4}}{x} + c$  (d)  $\frac{4}{3} \frac{(x^4+1)^{3/4}}{x} + c$
78.  $\int x \cos x^2 dx$  is equal to [MP PET 1999]  
 (a)  $-\frac{1}{2} \sin^2 x + C$  (b)  $\frac{1}{2} \sin^2 x + C$  (c)  $-\frac{1}{2} \sin x^2 + C$  (d)  $\frac{1}{2} \sin x^2 + C$
79.  $\int e^{-x} \operatorname{cosec}^2(2e^{-x}+5) dx =$  [AISSE 1988]  
 (a)  $\frac{1}{2} \cot(2e^{-x}+5) + c$  (b)  $-\frac{1}{2} \cot(2e^{-x}+5) + c$  (c)  $2 \cot(2e^{-x}+5) + c$  (d)  $-2 \cot(2e^{-x}+5) + c$
80.  $\int \frac{1+\tan x}{x+\log \sec x} dx =$  [AI CBSE 1986]  
 (a)  $\log(x+\log \sec x) + c$  (b)  $-\log(x+\log \sec x) + c$  (c)  $\log(x-\log \sec x) + c$  (d) None of these
81.  $\int \frac{x^3}{\sqrt{x^2+2}} dx =$   
 (a)  $\frac{1}{3}(x^2+2)^{3/2} + 2(x^2+2)^{1/2} + c$  (b)  $\frac{1}{3}(x^2+2)^{3/2} - 2(x^2+2)^{1/2} + c$   
 (c)  $\frac{1}{3}(x^2+2)^{3/2} + (x^2+2)^{1/2} + c$  (d)  $\frac{1}{3}(x^2+2)^{3/2} - (x^2+2)^{1/2} + c$
82.  $\int x^3 \sqrt{3+5x^4} dx =$  [DSSE 1982]  
 (a)  $(3+5x^4)^{3/2} + c$  (b)  $\frac{1}{5}(3+5x^4)^{3/2} + c$  (c)  $\frac{1}{30}(3+5x^4)^{3/2} + c$  (d) None of these
83.  $\int \sin^2 x \cos x dx$  is equal to [SCRA 1996]  
 (a)  $\frac{\cos^2 x}{2}$  (b)  $\frac{\sin^2 x}{3}$  (c)  $\frac{\sin^3 x}{3}$  (d)  $-\frac{\cos^2 x}{2}$
84.  $\int \frac{(1+\log x)^2}{x} dx =$  [Roorkee 1977]  
 (a)  $(1+\log x)^3 + c$  (b)  $3(1+\log x)^3 + c$  (c)  $\frac{1}{3}(1+\log x)^3 + c$  (d) None of these
85.  $\int \frac{\sin x dx}{(a+b \cos x)^2} =$   
 (a)  $\frac{1}{b}(a+b \cos x) + c$  (b)  $\frac{1}{b(a+b \cos x)} + c$  (c)  $\frac{1}{b} \log(a+b \cos x) + c$  (d) None of these
86.  $\int \cos^2(ax+b) \sin(ax+b) dx =$  [DSSE 1979]  
 (a)  $-\frac{\cos^3(ax+b)}{3a} + c$  (b)  $\frac{\cos^3(ax+b)}{3a} + c$  (c)  $\frac{\sin^3(ax+b)}{3a} + c$  (d)  $-\frac{\sin^3(ax+b)}{3a} + c$
87.  $\int \frac{1+\tan^2 x}{1-\tan^2 x} dx$  equals to [Rajasthan PET 2001]  
 (a)  $\log\left(\frac{1-\tan x}{1+\tan x}\right) + C$  (b)  $\log\left(\frac{1+\tan x}{1-\tan x}\right) + C$  (c)  $\frac{1}{2} \log\left(\frac{1-\tan x}{1+\tan x}\right) + C$  (d)  $\frac{1}{2} \log\left(\frac{1+\tan x}{1-\tan x}\right) + C$



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88.  $\int \frac{a^{\sqrt{x}}}{\sqrt{x}} dx =$  [Roorkee 1990; MP PET 2001]  
 (a)  $2a^{\sqrt{x}} \log_e a + c$  (b)  $2a^{\sqrt{x}} \log_a e + c$  (c)  $2a^{\sqrt{x}} \log_{10} a + c$  (d)  $2a^{\sqrt{x}} \log_a 10 + c$
89.  $\int \frac{t}{e^{3t^2}} dt =$  [MP PET 1997]  
 (a)  $\frac{1}{6} e^{3t^2} + c$  (b)  $-\frac{1}{6} e^{3t^2} + c$  (c)  $\frac{1}{6} e^{-3t^2} + c$  (d)  $-\frac{1}{6} e^{-3t^2} + c$
90.  $\int x e^{x^2} dx =$  [SCRA 1996; Rajasthan PET 2003]  
 (a)  $-\frac{e^{x^2}}{2} + C$  (b)  $\frac{e^{x^2}}{2} + C$  (c)  $\frac{e^x}{2} + C$  (d)  $-\frac{e^x}{2} + C$
91.  $\int e^{\sqrt{x}} dx$  is equal to [MP PET 1988]  
 (a)  $e^{\sqrt{x}} + A$  (b)  $\frac{1}{2} e^{\sqrt{x}} + A$  (c)  $2(\sqrt{x} - 1)e^{\sqrt{x}} + A$  (d)  $2(\sqrt{x} + 1)e^{\sqrt{x}} + A$   
 ( $A$  is an arbitrary constant)
92.  $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx =$  [DCE 1999]  
 (a)  $e^{\sqrt{x}}$  (b)  $\frac{e^{\sqrt{x}}}{2}$  (c)  $2e^{\sqrt{x}}$  (d)  $\sqrt{x} e^{\sqrt{x}}$
93.  $\int \frac{a dx}{b + ce^x} =$  [MP PET 1988; BIT Ranchi 1978]  
 (a)  $\frac{a}{b} \log \left[ \frac{e^x}{b + ce^x} \right] + k$  (b)  $\frac{a}{b} \log \left[ \frac{b + ce^x}{e^x} \right] + k$  (c)  $\frac{b}{a} \log \left[ \frac{e^x}{b + ce^x} \right] + k$  (d)  $\frac{b}{a} \log \left[ \frac{b + ce^x}{e^x} \right] + k$
94.  $\int \frac{1}{(e^x + e^{-x})^2} dx =$   
 (a)  $-\frac{1}{2(e^{2x} + 1)} + c$  (b)  $\frac{1}{2(e^{2x} + 1)} + c$  (c)  $-\frac{1}{e^{2x} + 1} + c$  (d) None of these
95.  $\int \frac{e^{2x} - 1}{e^{2x} + 1} dx =$  [MP PET 1987]  
 (a)  $\frac{e^{2x} - 1}{e^{2x} + 1} + c$  (b)  $\log(e^{2x} + 1) - x + c$  (c)  $\log(e^{2x} + 1) + c$  (d) None of these
96.  $\int \frac{e^{2x} + 1}{e^{2x} - 1} dx$  equals [Rajasthan PET 1996]  
 (a)  $\log(e^x - e^{-x}) + c$  (b)  $\log(e^x + e^{-x}) + c$  (c)  $\log(e^{-x} - e^x) + c$  (d)  $\log(1 - e^{-x}) + c$
97.  $\int \frac{dx}{e^x + e^{-x}} =$  [Bihar CEE 1997; MNR 1974]  
 (a)  $\tan^{-1}(e^{-x})$  (b)  $\tan^{-1}(e^x)$  (c)  $\log(e^x - e^{-x})$  (d)  $\log(e^x + e^{-x})$
98. What is the value of the integral  $I = \int \frac{dx}{(1 + e^x)(1 + e^{-x})}$  [DCE 1999]  
 (a)  $\frac{-1}{1 + e^x}$  (b)  $\frac{e^x}{1 + e^x}$  (c)  $\frac{1}{1 + e^x}$  (d) None of these

99.  $\int e^{3 \log x} (x^4 + 1)^{-1} dx =$  [MP PET 2001]  
 (a)  $\log(x^4 + 1) + c$  (b)  $\frac{1}{4} \log(x^4 + 1) + c$  (c)  $-\log(x^4 + 1) + c$  (d) None of these
100.  $\int \frac{e^{\tan^{-1} x}}{1 + x^2} dx =$  [MP PET 1987]  
 (a)  $\log(1 + x^2) - c$  (b)  $\log e^{\tan^{-1} x} + c$  (c)  $e^{\tan^{-1} x} + c$  (d)  $\tan^{-1} e^{\tan^{-1} x} + c$
101.  $\int \frac{e^{m \tan^{-1} x}}{1 + x^2} dx$  equals to [Rajasthan PET 2001]  
 (a)  $e^{\tan^{-1} x}$  (b)  $\frac{1}{m} e^{\tan^{-1} x}$  (c)  $\frac{1}{m} e^{m \tan^{-1} x}$  (d) None of these
102.  $\int e^{\cos^2 x} \sin 2x dx =$  [AI CBSE 1995]  
 (a)  $e^{\cos^2 x} + c$  (b)  $-e^{\cos^2 x} + c$  (c)  $\frac{1}{2} e^{\cos^2 x} + c$  (d) None of these
103.  $\int e^x \sin(e^x) dx =$  [MP PET 1995]  
 (a)  $-\cos e^x + c$  (b)  $\cos e^x + c$  (c)  $-\operatorname{cosec} e^x + c$  (d) None of these
104.  $\int \frac{dx}{e^x - 1} =$  [MP PET 1989]  
 (a)  $\ln(1 - e^{-x}) + c$  (b)  $-\ln(1 - e^{-x}) + c$  (c)  $\ln(e^x - 1) + c$  (d) None of these
105. The value of  $\int \left(1 + \frac{1}{x^2}\right) e^{\left(x - \frac{1}{x}\right)} dx$  equals [Kurukshetra CEE 1998]  
 (a)  $e^{x - \frac{1}{x}} + c$  (b)  $e^{x + \frac{1}{x}} + c$  (c)  $e^{x^2 - \frac{1}{x}} + c$  (d)  $e^{x^2 + \frac{1}{x^2}} + c$
106.  $\int \frac{x^2}{\sqrt{1 - x^3}} dx$  equals [Rajasthan PET 1987]  
 (a)  $\frac{2}{3} \sqrt{1 - x^3} + c$  (b)  $\frac{-2}{3} \sqrt{1 - x^3} + c$  (c)  $\frac{1}{3} \sqrt{1 - x^3} + c$  (d)  $\frac{-1}{3} \sqrt{1 - x^3} + c$
107.  $\int \frac{x}{1 + x^4} dx =$  [IIT 1978; UPSEAT 2002]  
 (a)  $\frac{1}{2} \cot^{-1} x^2 + c$  (b)  $\frac{1}{2} \tan^{-1} x^2 + c$  (c)  $\cot^{-1} x^2 + c$  (d)  $\tan^{-1} x^2 + c$
108.  $\int \frac{3x^2}{x^6 + 1} dx =$  [MNR 19981; MP PET 1988; Rajasthan PET 1995]  
 (a)  $\log(x^6 + 1) + c$  (b)  $\tan^{-1}(x^3) + c$  (c)  $3 \tan^{-1}(x^3) + c$  (d)  $3 \tan^{-1}\left(\frac{x^3}{3}\right) + c$
109.  $\int \frac{1}{\sqrt{1 - e^{2x}}} dx =$  [MP PET 1993, 2002; Rajasthan PET 1999]  
 (a)  $x - \log[1 + \sqrt{1 - e^{2x}}] + c$  (b)  $x + \log[1 + \sqrt{1 - e^{2x}}] + c$  (c)  $\log[1 + \sqrt{1 - e^{2x}}] - x + c$  (d) None of these

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110.  $\int \frac{\sec^2 x \, dx}{\sqrt{\tan^2 x + 4}} =$
- (a)  $\log \left[ \tan x + \sqrt{\tan^2 x + 4} \right] + c$  (b)  $\frac{1}{2} \log \left[ \tan x + \sqrt{\tan^2 x + 4} \right] + c$
- (c)  $\log \left[ \frac{1}{2} \tan x + \frac{1}{2} \sqrt{\tan^2 x + 4} \right] + c$  (d) None of these
111.  $\int \cos x \sqrt{4 - \sin^2 x} \, dx =$
- (a)  $\frac{1}{2} \sin x \sqrt{4 - \sin^2 x} - 2 \sin^{-1} \left( \frac{1}{2} \sin x \right) + c$  (b)  $\frac{1}{2} \sin x \sqrt{4 - \sin^2 x} + 2 \sin^{-1} \left( \frac{1}{2} \sin x \right) + c$
- (c)  $\frac{1}{2} \sin x \sqrt{4 - \sin^2 x} + \sin^{-1} \left( \frac{1}{2} \sin x \right) + c$  (d) None of these
112.  $\int \frac{3x^2}{\sqrt{9 - 16x^6}} \, dx =$
- (a)  $\frac{1}{4} \sin^{-1} \left( \frac{4x^3}{3} \right) + c$  (b)  $\frac{1}{3} \sin^{-1} \left( \frac{4x^3}{3} \right) + c$  (c)  $\frac{1}{4} \sin^{-1} x^3 + c$  (d)  $\frac{1}{3} \sin^{-1} x^3 + c$
113.  $\int \frac{x}{\sqrt{4 - x^4}} \, dx =$  [Roorkee 1976]
- (a)  $\cos^{-1} \frac{x^2}{2}$  (b)  $\frac{1}{2} \cos^{-1} \frac{x^2}{2}$  (c)  $\sin^{-1} \frac{x^2}{2}$  (d)  $\frac{1}{2} \sin^{-1} \frac{x^2}{2}$
114.  $\frac{a^x}{\sqrt{1 - a^{2x}}} \, dx =$  [MNR 1983, 87]
- (a)  $\frac{1}{\log a} \sin^{-1} a^x + c$  (b)  $\sin^{-1} a^x + c$  (c)  $\frac{1}{\log a} \cos^{-1} a^x + c$  (d)  $\cos^{-1} a^x + c$
115.  $\int \frac{\sin x \, dx}{3 + 4 \cos^2 x} =$  [Karnataka CET 2000]
- (a)  $\log(3 + 4 \cos^2 x) + c$  (b)  $\frac{-1}{2\sqrt{3}} \tan^{-1} \left( \frac{\cos x}{\sqrt{3}} \right) + c$  (c)  $\frac{-1}{2\sqrt{3}} \tan^{-1} \left( \frac{2 \cos x}{\sqrt{3}} \right) + c$  (d)  $\frac{1}{2\sqrt{3}} \tan^{-1} \left( \frac{2 \cos x}{\sqrt{3}} \right) + c$
116.  $\int \frac{\sin 2x}{a^2 + b^2 \sin^2 x} \, dx =$  [Roorkee 1977]
- (a)  $\frac{1}{b^2} \log(a^2 + b^2 \sin^2 x) + c$  (b)  $\frac{1}{b} \log(a^2 + b^2 \sin^2 x) + c$
- (c)  $\log(a^2 + b^2 \sin^2 x) + c$  (d)  $b^2 \log(a^2 + b^2 \sin^2 x) + c$
117.  $\int \frac{\sin x \cos x}{a \cos^2 x + b \sin^2 x} \, dx =$  [AI CBSE 1988, 89]
- (a)  $\frac{1}{2(b-a)} \log(a \cos^2 x + b \sin^2 x) + c$  (b)  $\frac{1}{b-a} \log(a \cos^2 x + b \sin^2 x) + c$
- (c)  $\frac{1}{2} \log(a \cos^2 x + b \sin^2 x) + c$  (d) None of these
118.  $\int \frac{1}{x\sqrt{1 + \log x}} \, dx$  [Roorkee 1997]
- (a)  $\frac{2}{3} (1 + \log x)^{3/2} + c$  (b)  $(1 + \log x)^{3/2} + c$  (c)  $2\sqrt{1 + \log x} + c$  (d)  $\sqrt{1 + \log x} + c$

119.  $\int \frac{dx}{x + x \log x} =$  [MP PET 1993; Roorkee 1977]  
 (a)  $\log(1 + \log x)$  (b)  $\log \log(1 + \log x)$  (c)  $\log x + \log(\log x)$  (d) None of these
120.  $\int \frac{\sin 2x}{1 + \sin^2 x} dx =$  [Roorkee 1976]  
 (a)  $\log \sin 2x + c$  (b)  $\log(1 + \sin^2 x) + c$  (c)  $\frac{1}{2} \log(1 + \sin^2 x) + c$  (d)  $\tan^{-1}(\sin x) + c$
121.  $\int \frac{\sec^2 x}{1 + \tan x} dx =$  [MP PET 1987]  
 (a)  $\log(\cos x + \sin x) + c$  (b)  $\log(\sec^2 x)$  (c)  $\log(1 + \tan x)$  (d)  $-\frac{1}{(1 + \tan x)^2}$
122.  $\int \frac{\operatorname{cosec}^2 x}{1 + \cot x} dx =$  [MNR 1973]  
 (a)  $\log(1 + \cot x) + c$  (b)  $-\log(1 + \cot x) + c$  (c)  $\frac{1}{2(1 + \cot x)^2} + c$  (d) None of these
123.  $\int \frac{1}{\sqrt{x}} \sin \sqrt{x} dx =$  [MP PET 1989]  
 (a)  $-\frac{1}{2} \cos \sqrt{x} + c$  (b)  $-2 \cos \sqrt{x} + c$  (c)  $\frac{1}{2} \cos \sqrt{x} + c$  (d)  $2 \cos \sqrt{x} + c$
124.  $\int \frac{x+1}{\sqrt{1+x^2}} dx =$  [MP PET 1991]  
 (a)  $\sqrt{1+x^2} + \tan^{-1} x + c$  (b)  $\sqrt{1+x^2} - \log\{x + \sqrt{1+x^2}\} + c$   
 (c)  $\sqrt{1+x^2} + \log\{x + \sqrt{1+x^2}\} + c$  (d)  $\sqrt{1+x^2} + \log(\sec x + \tan x) + c$
125.  $\int \frac{3^x}{\sqrt{9^x - 1}} dx =$  [EAMCET 202]  
 (a)  $\frac{1}{\log 3} \log|3^x + \sqrt{9^x - 1}| + c$  (b)  $\frac{1}{\log 3} \log|9^x + \sqrt{9^x - 1}| + c$   
 (c)  $\frac{1}{\log 9} \log|3^x + \sqrt{9^x - 1}| + c$  (d)  $\frac{1}{\log 9} \log|3^x - \sqrt{9^x - 1}| + c$
126. To find the value of  $\int \frac{1 + \log x}{x} dx$ , the proper substitution is [MP PET 1988]  
 (a)  $\log x = t$  (b)  $1 + \log x = t$  (c)  $\frac{1}{x} = t$  (d) None of these
127.  $\int \frac{10x^9 + 10^x \log_e 10}{10^x + x^{10}} dx =$  [MNR 1979]  
 (a)  $-\frac{1}{2} \frac{1}{(10^x + x^{10})^2}$  (b)  $\log(10^x + x^{10}) + c$  (c)  $\frac{1}{2} \frac{1}{(10^x + x^{10})^2} + c$  (d) None of these
128.  $\int \frac{\sin x}{\sin(x - \alpha)} dx =$  [Rajasthan PET 1999; Kerala (Engg.) 2002]  
 (a)  $x \cos \alpha - \sin \alpha \log \sin(x - \alpha) + c$  (b)  $x \cos \alpha + \sin \alpha \log \sin(x - \alpha) + c$   
 (c)  $x \sin \alpha - \sin \alpha \log \sin(x - \alpha) + c$  (d) None of these

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129.  $\int \frac{2x \tan^{-1} x^2}{1+x^4} dx =$  [Roorkee 1982]  
 (a)  $[\tan^{-1} x^2]^2 + c$  (b)  $\frac{1}{2}[\tan^{-1} x^2]^2 + c$  (c)  $2[\tan^{-1} x^2]^2 + c$  (d) None of these
130.  $\int \tan^{-1} \frac{2x}{1-x^2} dx =$  [MP PET 1991]  
 (a)  $x \tan^{-1} x + c$  (b)  $x \tan^{-1} x - \log(1+x^2) + c$  (c)  $2x \tan^{-1} x + \log(1+x^2) + c$  (d)  $2x \tan^{-1} x - \log(1+x^2) + c$
131.  $\int \sin^{-1}(3x-4x^3) dx =$  [AISSE 1986; DSSE 1984]  
 (a)  $x \sin^{-1} x + \sqrt{1-x^2} + c$  (b)  $x \sin^{-1} x - \sqrt{1-x^2} + c$  (c)  $2[x \sin^{-1} x + \sqrt{1-x^2}] + c$  (d)  $3[x \sin^{-1} x + \sqrt{1-x^2}] + c$
132. The value of  $\int \frac{2dx}{\sqrt{1-4x^2}}$  is [Karnataka CET 2001]  
 (a)  $\tan^{-1}(2x) + c$  (b)  $\cot^{-1}(2x) + c$  (c)  $\cos^{-1}(2x) + c$  (d)  $\sin^{-1}(2x) + c$
133.  $\int \frac{\cot x}{\log \sin x} dx =$  [MNR 1974]  
 (a)  $\log(\log \sin x) + c$  (b)  $\log(\log \operatorname{cosec} x) + c$  (c)  $2 \log(\log \sin x) + c$  (d) None of these
134. If  $\int f(x) dx = f(x)$ , then  $\int [f(x)]^2 dx$  is [DCE 2002]  
 (a)  $\frac{1}{2}[f(x)]^2$  (b)  $[f(x)]^3$  (c)  $\frac{[f(x)]^3}{3}$  (d)  $[f(x)]^2$
135. Integral of  $f(x) = \sqrt{1+x^2}$  with respect to  $x^2$  is  
 (a)  $\frac{2}{3} \frac{(1+x^2)^{3/2}}{x} + k$  (b)  $\frac{2}{3} (1+x^2)^{3/2} + k$  (c)  $\frac{2}{3} x(1+x^2)^{3/2} + k$  (d) None of these
136.  $\int \frac{d(x^2+1)}{\sqrt{x^2+2}}$  is equal to  
 (a)  $2\sqrt{x^2+2} + k$  (b)  $\sqrt{x^2+2} + k$  (c)  $\frac{1}{(x^2+2)^{3/2}} + k$  (d) None of these
137.  $\int x \sec x^2 dx$  is equal to  
 (a)  $\frac{1}{2} \log(\sec x^2 + \tan x^2) + k$  (b)  $\frac{x^2}{2} \log(\sec x^2 + \tan x^2) + k$   
 (c)  $2 \log(\sec x^2 + \tan x^2) + k$  (d) None of these
138.  $\int f(ax+b)\{f(ax+b)\}^n dx$  is equal to  
 (a)  $\frac{1}{n+1} \{f(ax+b)\}^{n+1} + c, \forall n \text{ except } n = -1$  (b)  $\frac{1}{n+1} \{f(ax+b)\}^{n+1} + c, \forall n$   
 (c)  $\frac{1}{a(n+1)} \{f(ax+b)\}^{n+1} + c, \forall n \text{ except } n = -1$  (d)  $\frac{1}{a(n+1)} \{f(ax+b)\}^{n+1} + c, \forall n$
139.  $\int \frac{\sin x - \cos x}{\sqrt{1-\sin 2x}} e^{\sin x} \cos x dx$  is equal to  
 (a)  $e^{\sin x} + c$  (b)  $e^{\sin x - \cos x} + c$  (c)  $e^{\sin x + \cos x} + c$  (d)  $e^{\cos x - \sin x} + c$
140.  $\int 5^{5^x} \cdot 5^{5^x} \cdot 5^x dx$  is equal to  
 (a)  $\frac{5^{5^x}}{(\log 5)^3} + c$  (b)  $5^{5^x} (\log 5)^3 + c$  (c)  $\frac{5^{5^x}}{(\log 5)^3} + c$  (d) None of these

141. If  $\int \frac{2x}{\sqrt{1-4^x}} dx = k \sin^{-1}(2^x) + c$ , then  $k$  is equal to
- (a)  $\log 2$  (b)  $\frac{1}{2} \log 2$  (c)  $\frac{1}{2}$  (d)  $\frac{1}{\log 2}$
142.  $\int \frac{1}{\sqrt{\sin^3 x \cos x}} dx$  is equal to
- (a)  $\frac{-2}{\sqrt{\tan x}} + c$  (b)  $2\sqrt{\tan x} + c$  (c)  $\frac{2}{\sqrt{\tan x}} + c$  (d)  $-2\sqrt{\tan x} + c$
143.  $\int \frac{\sec x dx}{\sqrt{\cos 2x}} =$
- (a)  $\sin^{-1}(\tan x)$  (b)  $\tan x$  (c)  $\cos^{-1}(\tan x)$  (d)  $\frac{\sin x}{\sqrt{\cos x}}$
144.  $\int \frac{x dx}{1 - x \cot x} =$
- (a)  $\log(\cos x - x \sin x) + c$  (b)  $\log(x \sin x - \cos x) + c$  (c)  $\log(\sin x - x \cos x) + c$  (d) None of these
145. To evaluate  $\int \frac{\sec^2 x}{(1 + \tan x)(2 + \tan x)} dx$ , the most suitable substitution is
- (a)  $1 + \tan x = t$  (b)  $2 + \tan x = t$  (c)  $\tan x = t$  (d) None of these
146. For which of the following functions, the substitution  $x^2 = t$  is applicable
- (a)  $\int x^6 \tan^{-1} x^3 dx$  (b)  $\int \tan^{-1}\left(\frac{2x}{1-x^2}\right) dx$  (c)  $\int x^3 \cos x^2 dx$  (d) None of these
147.  $\int x \sqrt{\frac{1-x^2}{1+x^2}} dx =$
- (a)  $\frac{1}{2} [\sin^{-1} x^2 + \sqrt{1-x^4}] + c$  (b)  $\frac{1}{2} [\sin^{-1} x^2 + \sqrt{1-x^2}] + c$
- (c)  $\sin^{-1} x^2 + \sqrt{1-x^4} + c$  (d)  $\sin^{-1} x^2 + \sqrt{1-x^2} + c$
148.  $\int \frac{1}{\cos^2 x (1 - \tan x)^2} dx =$
- (a)  $\frac{1}{\tan x - 1} + c$  (b)  $\frac{1}{1 - \tan x} + c$  (c)  $-\frac{1}{3} \frac{1}{(1 - \tan x)^3} + c$  (d) None of these
149.  $\int \sec^p x \tan x dx =$
- (a)  $\frac{\sec^{p+1} x}{p+1} + c$  (b)  $\frac{\sec^p x}{p} + c$  (c)  $\int \frac{\tan^{p+1} x}{p+1} + c$  (d)  $\frac{\tan^p x}{p} + c$

### Advance Level

150. Consider the following statements:

[SCRA 1996]

**Assertion (A):**  $\frac{1}{x^2 + a^2}$  can be integrated by a substitution  $x = a \tan \theta$ .

**Reason (R):** Because all integrands are integrated by the method of substitution only.

Of these statements

- (a) Both A and R are true and R is the correct explanation of A (b) Both A and R are true but R is not the correct explanation of A

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- (c)  $A$  is true but  $R$  is false (d)  $A$  is false but  $R$  is true
151.  $\int \sqrt{\frac{a-x}{x}} dx =$
- (a)  $a \left[ \sin^{-1} \sqrt{\frac{x}{a}} + \sqrt{\frac{x}{a}} \sqrt{\frac{a-x}{a}} \right] + C$  (b)  $a \left[ \sin^{-1} \sqrt{\frac{x}{a}} - \sqrt{\frac{x}{a}} \sqrt{\frac{a-x}{a}} \right] + C$
- (c)  $-a \left[ \sin^{-1} \sqrt{\frac{x}{a}} + \sqrt{\frac{x}{a}} \sqrt{\frac{a-x}{a}} \right] + C$  (d) None of these
152.  $\int \frac{\sin x}{\sin x - \cos x} dx =$  [Roorkee 1988]
- (a)  $\frac{1}{2} \log(\sin x - \cos x) + x + c$  (b)  $\frac{1}{2} [\log(\sin x - \cos x) + x] + c$
- (c)  $\frac{1}{2} \log(\cos x - \sin x) + x + c$  (d)  $\frac{1}{2} [\log(\cos x - \sin x) + x] + c$
153.  $\int \frac{1+x^2}{\sqrt{1-x^2}} dx =$  [IIT 1977]
- (a)  $\frac{3}{2} \sin^{-1} x - \frac{1}{2} x \sqrt{1-x^2} + c$  (b)  $\frac{3}{2} \sin^{-1} x + \frac{1}{2} x \sqrt{1-x^2} + c$
- (c)  $\frac{3}{2} \cos^{-1} x - \frac{1}{2} x \sqrt{1-x^2} + c$  (d)  $\frac{3}{2} \cos^{-1} x + \frac{1}{2} x \sqrt{1-x^2} + c$
154. If  $I = \int \sec^4 x \operatorname{cosec}^2 x dx = K \tan^3 x + L \tan x + M \cot x + \text{constant}$ , then
- (a)  $K = \frac{1}{3}, L = 1, M = 2$  (b)  $K = \frac{1}{3}, L = 2, M = -1$  (c)  $K = -1, L = 0, M = 1$  (d) None of these
155.  $\int \frac{\log(x+1) - \log x}{x(x+1)} dx =$
- (a)  $-\log\left(\frac{x+1}{x}\right) + c$  (b)  $-\log\left[\log\left(\frac{x+1}{x}\right)\right] + c$
- (c)  $-\left(\frac{1}{2}\right) \left[\log\left(\frac{x+1}{x}\right)\right]^2 + c$  (d)  $c - \frac{1}{2} [(\log(x+1))^2 - (\log x)^2]$
156.  $\int \frac{dx}{\sqrt{1+\sin x}} =$
- (a)  $\sqrt{2} \log \tan(x/4 + \pi/8)$  (b)  $\sqrt{2} \log [\operatorname{cosec}(x/2 + \pi/4) - \cot(x/2 + \pi/4)]$
- (c)  $\sqrt{2} \log [\sec(x/2 - \pi/4) + \tan(x/2 - \pi/4)]$  (d) All (a), (b) and (c)
157.  $\int \frac{x+1}{x(1+xe^x)^2} dx = \log|1-f(x)| + f(x) + c$ , then  $f(x) =$
- (a)  $\frac{1}{x+e^x}$  (b)  $\frac{1}{1+xe^x}$  (c)  $\frac{1}{(1+xe^x)^2}$  (d) None of these
158. If  $I^r(x)$  means  $\log \log \log \dots \log x$ , the log being repeated  $r$  times, then  $\int \frac{1}{x I^1(x) I^2(x) I^3(x) \dots I^r(x)} dx =$
- (a)  $I^{r+1}(x) + c$  (b)  $\frac{I^{r+1}(x)}{r+1} + c$  (c)  $I^r(x) + c$  (d) None of these

159.  $\int x \sqrt{\frac{2 \sin(x^2 - 1) - \sin 2(x^2 - 1)}{2 \sin(x^2 - 1) + \sin 2(x^2 - 1)}} dx =$  , (where  $x^2 - 1 \neq n\pi$ )
- (a)  $\log \frac{1}{2} \sec(x^2 - 1)$  (b)  $\log \sec\left(\frac{x^2 - 1}{2}\right)$  (c)  $\frac{1}{2} \log \sec(x^2 - 1)$  (d) None of these
160.  $\int \cos\left\{2 \tan^{-1} \sqrt{\frac{1-x}{1+x}}\right\} dx$  is equal to
- (a)  $\frac{1}{8}(x^2 - 1) + k$  (b)  $\frac{1}{2}x^2 + k$  (c)  $\frac{1}{2}x + k$  (d) None of these
161. Let the equation of a curve passing through the point (0,1) be given by  $y = \int x^2 \cdot e^{x^3} dx$ . If the equation of the curve is written in the form  $x = f(y)$  then  $f(y)$  is
- (a)  $\sqrt{\log_e(3y - 2)}$  (b)  $\sqrt[3]{\log_e(3y - 2)}$  (c)  $\sqrt[3]{\log_e(2 - 3y)}$  (d) None of these
162.  $\int \sqrt{\frac{\cos x - \cos^3 x}{1 - \cos^3 x}} dx$  is equal to
- (a)  $\frac{2}{3} \sin^{-1}(\cos^{3/2} x) + c$  (b)  $\frac{3}{2} \sin^{-1}(\cos^{3/2} x) + c$  (c)  $\frac{2}{3} \cos^{-1}(\cos^{3/2} x) + c$  (d) None of these
163. The value of  $\int \frac{ax^2 - b}{x\sqrt{c^2x^2 - (ax^2 + b)^2}} dx$  is
- (a)  $\sin^{-1}\left[\frac{ax + \frac{b}{x}}{c}\right] + k$  (b)  $\sin^{-1}\left[\frac{ax^2 + \frac{b}{x^2}}{c}\right] + k$  (c)  $\cos^{-1}\left[\frac{ax + \frac{b}{x}}{c}\right] + k$  (d)  $\cos^{-1}\left[\frac{ax^2 + \frac{b}{x^2}}{c}\right] + k$
164.  $\int \sqrt{\frac{1 - \sqrt{x}}{1 + \sqrt{x}}} dx =$  [IIT 1985]
- (a)  $\cos^{-1} \sqrt{x} + \sqrt{1 - x} \cdot (\sqrt{x} - 2) + c$  (b)  $\cos^{-1} \sqrt{x} - \sqrt{1 - x} \cdot (\sqrt{x} - 2) + c$   
 (c)  $\cos^{-1} \sqrt{x} + \sqrt{1 - x} \cdot (\sqrt{x} - 2) + c$  (d) None of these
165.  $\int \frac{\sin 2x}{\sin^4 x + \cos^4 x} dx =$  [Rajasthan PET 1995]
- (a)  $\cot^{-1}(\tan^2 x) + c$  (b)  $\tan^{-1}(\tan^2 x) + c$  (c)  $\cot^{-1}(\cot^2 x) + c$  (d)  $\tan^{-1}(\cot^2 x) + c$
166.  $\int \tan^3 2x \sec 2x dx =$  [IIT 1977]
- (a)  $\frac{1}{6} \sec^3 2x - \frac{1}{2} \sec 2x + c$  (b)  $\frac{1}{6} \sec^3 2x + \frac{1}{2} \sec 2x + c$  (c)  $\frac{1}{9} \sec^2 2x - \frac{1}{3} \sec 2x + c$  (d) None of these
167. The value of  $\int \frac{\sqrt{(x^2 - a^2)}}{x} dx$  will be [UPSEAT 1999]
- (a)  $\sqrt{(x^2 - a^2)} - \tan^{-1}\left[\frac{\sqrt{(x^2 - a^2)}}{a}\right]$  (b)  $\sqrt{(x^2 - a^2)} + \tan^{-1}\left[\frac{\sqrt{(x^2 - a^2)}}{a}\right]$   
 (c)  $\sqrt{(x^2 - a^2)} + a^2 \tan^{-1}\left[\frac{\sqrt{(x^2 - a^2)}}{a}\right]$  (d)  $\tan^{-1} \frac{x}{a} + c$



## Basic Level

168.  $\int (1 - x^2) \log x \, dx =$  [DSSE 1982]

(a)  $\left(x - \frac{x^3}{3}\right) \log x - \left(x - \frac{x^3}{9}\right) + c$

(b)  $\left(x - \frac{x^3}{3}\right) \log x + \left(x - \frac{x^3}{9}\right) + c$

(c)  $\left(x + \frac{x^3}{3}\right) \log x + \left(x + \frac{x^3}{9}\right) + c$

(d) None of these

169.  $\int \frac{1}{x^2} \log(x^2 + a^2) \, dx$  [MNR 1980]

(a)  $\frac{1}{x} \log(x^2 + a^2) + \frac{2}{a} \tan^{-1} \frac{x}{a} + c$

(b)  $-\frac{1}{x} \log(x^2 + a^2) + \frac{2}{a} \tan^{-1} \frac{x}{a} + c$

(c)  $-\frac{1}{x} \log(x^2 + a^2) - \frac{2}{a} \tan^{-1} \frac{x}{a} + c$

(d) None of these

170.  $\int \frac{\log x}{x^3} \, dx =$  [Roorkee 1986]

(a)  $\frac{1}{4x^2} (2 \log x - 1) + C$

(b)  $-\frac{1}{4x^2} (2 \log x + 1) + C$

(c)  $\frac{1}{4x^2} (2 \log x + 1) + C$

(d)  $\frac{1}{4x^2} (1 - 2 \log x) + C$

171.  $\int x^3 \log x \, dx =$  [Karnataka CET 2002]

(a)  $\frac{x^4 \log x}{4} + C$

(b)  $\frac{1}{16} [4x^4 \log x - x^4] + C$

(c)  $\frac{1}{8} [4x^4 \log x - 4x^2] + C$

(d)  $\frac{1}{16} [4x^4 \log x + x^4] + C$

172.  $\int x \sin^{-1} x \, dx =$  [MP PET 1991]

(a)  $\left(\frac{x^2}{2} - \frac{1}{4}\right) \sin^{-1} x + \frac{x}{4} \sqrt{1 - x^2} + c$

(b)  $\left(\frac{x^2}{2} + \frac{1}{4}\right) \sin^{-1} x + \frac{x}{4} \sqrt{1 - x^2} + c$

(c)  $\left(\frac{x^2}{2} - \frac{1}{4}\right) \sin^{-1} x - \frac{x}{4} \sqrt{1 - x^2} + c$

(d)  $\left(\frac{x^2}{2} + \frac{1}{4}\right) \sin^{-1} x - \frac{x}{4} \sqrt{1 - x^2} + c$

173.  $\int \cos(\log_e x) \, dx$  is equal to [MP PET 2003]

(a)  $\frac{1}{2} x \{ \cos(\log_e x) + \sin(\log_e x) \}$

(b)  $x \{ \cos(\log_e x) + \sin(\log_e x) \}$

(c)  $\frac{1}{2} x \{ \cos(\log_e x) - \sin(\log_e x) \}$

(d)  $x \{ \cos(\log_e x) - \sin(\log_e x) \}$

174. If  $\int x e^{2x} \, dx$  is equal to  $e^{2x} f(x) + c$  where  $c$  is constant of integration, then  $f(x)$  is [UPSEAT 2001]

(a)  $(3x - 1)/4$

(b)  $(2x + 1)/2$

(c)  $(2x - 1)/4$

(d)  $(x - 4)/6$

175.  $\int e^{2x} \left( \frac{\sin 4x - 2}{1 - \cos 4x} \right) dx =$  [Mathematics Olympiad 1986]

(a)  $\frac{1}{2} e^{2x} \cot 2x + c$

(b)  $-\frac{1}{2} e^{2x} \cot 2x + c$

(c)  $-2e^{2x} \cot 2x + c$

(d)  $2e^{2x} \cot 2x + c$

176.  $\int x \cos x \, dx =$  [MP PET 1988]

- (a)  $x \sin x + \cos x$  (b)  $x \sin x - \cos x$  (c)  $x \cos x + \sin x$  (d)  $x \cos x - \sin x$

177.  $\int x \cos^2 x \, dx =$  [IIT 1972]

- (a)  $\frac{x^4}{4} - \frac{1}{4}x \sin 2x - \frac{1}{8} \cos 2x + c$  (b)  $\frac{x^4}{4} + \frac{1}{4}x \sin 2x + \frac{1}{8} \cos 2x + c$   
 (c)  $\frac{x^4}{4} - \frac{1}{4}x \sin 2x + \frac{1}{8} \cos 2x + c$  (d)  $\frac{x^4}{4} + \frac{1}{4}x \sin 2x - \frac{1}{8} \cos 2x + c$

178. If  $\frac{d}{dx} f(x) = x \cos x + \sin x$  and  $f(0) = 2$ , then  $f(x) =$  [MP PET 1989]

- (a)  $x \sin x$  (b)  $x \cos x + \sin x + 2$  (c)  $x \sin x + 2$  (d)  $x \cos x + 2$

179.  $\int e^{x/2} \sin\left(\frac{x}{2} + \frac{\pi}{4}\right) dx =$  [Roorkee 1982]

- (a)  $e^{x/2} \cos \frac{x}{2} + c$  (b)  $\sqrt{2} e^{x/2} \cos \frac{x}{2} + c$  (c)  $e^{x/2} \sin \frac{x}{2} + c$  (d)  $\sqrt{2} e^{x/2} \sin \frac{x}{2} + c$

180.  $\int x \sin^2 x \, dx =$  [Ranchi BIT 1977; IIT 1972]

- (a)  $\frac{x^2}{4} + \frac{x}{4} \sin 2x + \frac{1}{8} \cos 2x + c$  (b)  $\frac{x^2}{4} - \frac{x}{4} \sin 2x + \frac{1}{8} \cos 2x + c$   
 (c)  $\frac{x^2}{4} + \frac{x}{4} \sin 2x - \frac{1}{8} \cos 2x + c$  (d)  $\frac{x^2}{4} - \frac{x}{4} \sin 2x - \frac{1}{8} \cos 2x + c$

181.  $\int \frac{x - \sin x}{1 - \cos x} dx =$  [AISSE 1989]

- (a)  $x \cot \frac{x}{2} + c$  (b)  $-x \cot \frac{x}{2} + c$  (c)  $\cot \frac{x}{2} + c$  (d) None of these

182.  $\int x^2 \sin 2x \, dx =$  [IIT 1974]

- (a)  $\frac{1}{2} x^2 \cos 2x + \frac{1}{2} x \sin 2x + \frac{1}{4} \cos 2x + c$  (b)  $-\frac{1}{2} x^2 \cos 2x + \frac{1}{2} x \sin 2x + \frac{1}{4} \cos 2x + c$   
 (c)  $\frac{1}{2} x^2 \cos 2x - \frac{1}{2} x \sin 2x + \frac{1}{4} \cos 2x + c$  (d) None of these

183.  $\int \log x \, dx =$  [MNR 1979; Ranchi BIT 1992; SCRA 1996]

- (a)  $x + x \log x + c$  (b)  $x \log x - x + c$  (c)  $x^2 \log x + c$  (d)  $\frac{1}{x} \log x + x + c$

184.  $\int \log_{10} x \, dx =$  [Roorkee 1973]

- (a)  $x \log_{10} x + c$  (b)  $x(\log_{10} x + \log_{10} e) + c$  (c)  $\log_{10} x + c$  (d)  $x(\log_{10} x - \log_{10} e) + c$

185.  $\int \frac{\log x}{(1 + \log x)^2} dx =$

- (a)  $\frac{1}{1 + \log x} + c$  (b)  $\frac{x}{(1 + \log x)^2} + c$  (c)  $\frac{x}{1 + \log x} + c$  (d)  $\frac{1}{(1 + \log x)^2} + c$

186.  $\int \left[ \frac{1}{\log x} - \frac{1}{(\log x)^2} \right] dx =$

- (a)  $\frac{1}{\log x} + c$  (b)  $\frac{x}{\log x} + c$  (c)  $\frac{x}{(\log x)^2}$  (d) None of these

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187.  $\int e^{2x} \sin 3x \, dx =$  [Pb. CET 1994]
- (a)  $\frac{e^{2x}}{13}(2 \sin 3x + 3 \cos 3x) + c$  (b)  $\frac{e^{2x}}{13}(2 \sin 3x - 3 \cos 3x) + c$
- (c)  $\frac{e^{2x}}{13}(2 \cos 3x + 3 \sin 3x) + c$  (d)  $\frac{e^{2x}}{13}(2 \cos 3x - 3 \sin 3x) + c$
188. If  $I = \int e^x \sin 2x \, dx$ , then for what value of  $K$ ,  $KI = e^x(\sin 2x - 2 \cos 2x) + \text{const.}$  [MP PET 1992]
- (a) 1 (b) 3 (c) 5 (d) 7
189. If  $\int g(x) \, dx = g(x)$ , then  $\int g(x)\{f(x) + f'(x)\} \, dx$  is equal to
- (a)  $g(x)f(x) - g(x)f'(x) + c$  (b)  $g(x)f'(x) + c$
- (c)  $g(x)f(x) + c$  (d)  $g(x)f^2(x) + c$
190. The primitive of the function  $x|\cos x|$  when  $\frac{\pi}{2} < x < \pi$  is given by
- (a)  $\cos x + x \sin x$  (b)  $-\cos x - x \sin x$  (c)  $x \sin x - \cos x$  (d) None of these
191.  $\int \log(x+1) \, dx =$  [Roorkee 1974]
- (a)  $(x+1)\log(x+1) - x + c$  (b)  $(x+1)\log(x+1) + x + c$  (c)  $(x-1)\log(x+1) - x + c$  (d) None of these
192.  $\int \frac{1}{\log_x e} \, dx =$  [MP PET 1994]
- (a)  $\log \log_x e + c$  (b)  $\frac{1}{(\log_x e)^2} + c$  (c)  $x \log\left(\frac{x}{e}\right) + c$  (d) None of these
193.  $\int (\log x)^2 \, dx =$  [IIT 1971, 77]
- (a)  $x(\log x)^2 - 2x \log x - 2x + c$  (b)  $x(\log x)^2 - 2x \log x - x + c$
- (c)  $x(\log x)^2 - 2x \log x + 2x + c$  (d)  $x(\log x)^2 - 2x \log x + x + c$
194.  $\int x \log x \, dx =$  [MP PET 1987]
- (a)  $\frac{x^2}{2} \log x - \frac{x^2}{2} + c$  (b)  $\frac{x^2}{2} \log x - \frac{x^2}{4} + c$  (c)  $\frac{x^2}{2} \log x + \frac{x^2}{2} + c$  (d) None of these
195. If  $\int \ln(x^2 + x) \, dx = x \ln(x^2 + x) + A$ , then  $A =$  [MP PET 1992]
- (a)  $2x + \ln(x+1) + \text{const.}$  (b)  $2x - \ln(x+1) + \text{const.}$  (c) Constant (d) None of these
196. The value of  $\int \frac{\log x}{(x+1)^2} \, dx$  is [UPSEAT 1999]
- (a)  $\frac{-\log x}{x+1} + \log x - \log(x+1)$  (b)  $\frac{\log x}{x+1} + \log x - \log(x+1)$
- (c)  $\frac{\log x}{x+1} - \log x - \log(x+1)$  (d)  $\frac{-\log x}{x+1} - \log x - \log(x+1)$
197.  $\int \tan^{-1} x \, dx =$  [Roorkee 1977]
- (a)  $x \tan^{-1} x + \frac{1}{2} \log(1+x^2)$  (b)  $x \tan^{-1} x - \frac{1}{2} \log(1+x^2)$  (c)  $(x-1) \tan^{-1} x$  (d)  $x \tan^{-1} x - \log(1+x^2)$

198.  $\int x \tan^{-1} x dx =$  [Roorkee 1979]
- (a)  $\frac{1}{2}(x^2 + 1)\tan^{-1} x - \frac{1}{2}x + c$  (b)  $\frac{1}{2}(x^2 - 1)\tan^{-1} x - \frac{1}{2}x + c$
- (c)  $\frac{1}{2}(x^2 + 1)\tan^{-1} x + \frac{1}{2}x + c$  (d)  $\frac{1}{2}(x^2 + 1)\tan^{-1} x - x + c$
199.  $\int e^x(1 + \tan x) \sec x dx =$
- (a)  $e^x \cot x$  (b)  $e^x \tan x$  (c)  $e^x \sec x$  (d)  $e^x \cos x$
200.  $\int e^x \left[ \sin^{-1} \frac{x}{a} + \frac{1}{\sqrt{a^2 - x^2}} \right] dx =$
- (a)  $\frac{1}{a} e^x \sin^{-1} \frac{x}{a} + c$  (b)  $ae^x \sin^{-1} \frac{x}{a} + c$  (c)  $e^x \sin^{-1} \frac{x}{a} + c$  (d)  $\frac{e^x}{\sqrt{a^2 - x^2}} + c$
201.  $\int e^x \sin x (\sin x + 2 \cos x) dx =$  [MP PET 1988]
- (a)  $e^x \sin^2 x + c$  (b)  $e^x \sin x + c$  (c)  $e^x \sin 2x$  (d) None of these
202.  $\int e^x \left( \frac{1}{x} - \frac{1}{x^2} \right) dx =$  [AISSE 1983; MP PET 1994, 96; MNR 1990]
- (a)  $-\frac{e^x}{x^2} + c$  (b)  $\frac{e^x}{x^2} + c$  (c)  $\frac{e^x}{x} + c$  (d)  $-\frac{e^x}{x} + c$
203.  $\int e^x [f(x) + f'(x)] dx$  is equal to [DCE 2002]
- (a)  $e^x f(x)$  (b)  $e^x$  (c)  $e^x f'(x)$  (d) None of these
204.  $\int \left( \frac{x+2}{x+4} \right) e^x dx$  is equal to [AMU 2000]
- (a)  $e^x \left( \frac{x}{x+4} \right) + C$  (b)  $e^x \left( \frac{x+2}{x+4} \right) + C$  (c)  $e^x \left( \frac{x-2}{x+4} \right) + C$  (d)  $\left( \frac{2xe^x}{x+4} \right) + C$
205.  $\int \frac{x-1}{(x+1)^3} e^x dx =$  [IIT 1983; MP PET 1990]
- (a)  $\frac{-e^x}{(x+1)^2} + c$  (b)  $\frac{e^x}{(x+1)^2} + c$  (c)  $\frac{e^x}{(x+1)^3} + c$  (d)  $\frac{-e^x}{(x+1)^3} + c$
206.  $\int \frac{xe^x}{(1+x)^2} dx =$  [MP PET 1997; UPSEAT 2001; Rajasthan PET 2002]
- (a)  $\frac{e^{-x}}{1+x} + C$  (b)  $-\frac{e^{-x}}{1+x} + c$  (c)  $\frac{e^x}{1+x} + c$  (d)  $-\frac{e^x}{1+x} + c$
207.  $\int e^x \frac{(x^2+1)}{(x+1)^2} dx =$
- (a)  $\left( \frac{x-1}{x+1} \right) e^x + c$  (b)  $e^x \left( \frac{x+1}{x-1} \right) + c$  (c)  $e^x (x+1)(x-1) + c$  (d) None of these
208. The value of  $\int e^{2x} (2 \sin 3x + 3 \cos 3x) dx$  is [MP PET 2003]
- (a)  $e^{2x} \sin 3x$  (b)  $e^{2x} \cos 3x$  (c)  $e^{2x}$  (d)  $e^{2x} (2 \sin 3x)$

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209.  $\int e^x \cdot \left( \frac{1 + \sin x}{1 + \cos x} \right) dx$  is equal to [Rajasthan PET 1997; Karnataka CET 2003]
- (a)  $e^x \cdot \tan\left(\frac{x}{2}\right) + C$  (b)  $e^x \cdot \cot\left(\frac{x}{2}\right) + C$  (c)  $e^x \cdot \tan x + C$  (d)  $e^x \cdot \cot x + C$
210.  $\int e^x \cdot (1 + \tan x + \tan^2 x) dx =$  [Karnataka CET 1999]
- (a)  $e^x \sin x + C$  (b)  $e^x \cos x + C$  (c)  $e^x \tan x + C$  (d)  $e^x \sec x + C$
211.  $\int (1 + x - x^{-1})e^{x+x^{-1}} dx =$  [EAMCET 2003]
- (a)  $(x+1)e^{x+x^{-1}} + C$  (b)  $(x-1)e^{x+x^{-1}} + C$  (c)  $-xe^{x+x^{-1}} + C$  (d)  $xe^{x+x^{-1}} + C$
212.  $\int e^{-x}(1 - \tan x) \sec x dx$  is equal to
- (a)  $e^{-x} \sec x + C$  (b)  $e^{-x} \tan x + C$  (c)  $-e^{-x} \tan x + C$  (d) None of these
213. Let  $\int e^x \{f(x) - f'(x)\} dx = \phi(x)$  Then  $\int e^x f(x) dx$  is
- (a)  $\phi(x) + e^x f(x)$  (b)  $\phi(x) - e^x f(x)$  (c)  $\frac{1}{2} \{\phi(x) + e^x f(x)\}$  (d)  $\frac{1}{2} \{\phi(x) + e^x f'(x)\}$
214. If  $\int f(x) dx = g(x)$ , then  $\int f^{-1}(x) dx$  is equal to [MP PET 2003]
- (a)  $g^{-1}(x)$  (b)  $xf^{-1}(x) - g(f^{-1}(x))$  (c)  $xf^{-1}(x) - g^{-1}(x)$  (d)  $f^{-1}(x)$
215.  $\int \sin \sqrt{x} dx =$  [Roorkee 1977]
- (a)  $2[\sin \sqrt{x} - \cos \sqrt{x}] + c$  (b)  $2[\sin \sqrt{x} - \sqrt{x} \cos \sqrt{x}] + c$  (c)  $2[\sin \sqrt{x} + \cos \sqrt{x}] + c$  (d)  $2[\sin \sqrt{x} + \sqrt{x} \cos \sqrt{x}] + c$
216.  $\int \cos \sqrt{x} dx =$  [BIT Ranchi 1990; IIT 1997; Rajasthan PET 1999]
- (a)  $2[\sqrt{x} \sin \sqrt{x} + \cos \sqrt{x}] + c$  (b)  $2[\sqrt{x} \sin \sqrt{x} - \cos \sqrt{x}] + c$  (c)  $2[\cos \sqrt{x} - \sqrt{x} \sin \sqrt{x}] + c$  (d)  $-2[\sqrt{x} \sin \sqrt{x} + \cos \sqrt{x}] + c$
217.  $\int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx =$  [MNR 1978; EAMCET 1982; IIT 1984]
- (a)  $x - \sqrt{1-x^2} \sin^{-1} x + c$  (b)  $x + \sqrt{1-x^2} \sin^{-1} x + c$  (c)  $\sqrt{1-x^2} \sin^{-1} x - x + c$  (d) None of these
218.  $\int \frac{x \tan^{-1} x dx}{(1+x^2)^{3/2}}$
- (a)  $\frac{x + \tan^{-1} x}{\sqrt{1+x^2}} + c$  (b)  $\frac{x - \tan^{-1} x}{\sqrt{1+x^2}} + c$  (c)  $\frac{\tan^{-1} x - x}{\sqrt{1+x^2}} + c$  (d) None of these

### Advance Level

219.  $\int [\sin(\log x) + \cos(\log x)] dx =$  [MP PET 1991]
- (a)  $x \cos(\log x) + c$  (b)  $\sin(\log x) + c$  (c)  $\cos(\log x) + c$  (d)  $x \sin(\log x) + c$

220.  $\int \cos 2\theta \log \left( \frac{\cos \theta + \sin \theta}{\cos \theta - \sin \theta} \right) d\theta =$  [IIT 1994]

(a)  $(\cos \theta - \sin \theta)^2 \log \left( \frac{\cos \theta + \sin \theta}{\cos \theta - \sin \theta} \right)$

(b)  $(\cos \theta + \sin \theta)^2 \log \left( \frac{\cos \theta + \sin \theta}{\cos \theta - \sin \theta} \right)$

(c)  $\frac{(\cos \theta - \sin \theta)^2}{2} \log \left( \frac{\cos \theta - \sin \theta}{\cos \theta + \sin \theta} \right)$

(d)  $\frac{1}{2} \sin 2\theta \log \tan \left( \frac{\pi}{4} + \theta \right) - \frac{1}{2} \log \sec 2\theta$

221.  $\int \left[ \log(\log x) + \frac{1}{(\log x)^2} \right] dx =$

(a)  $x \log(\log x) + \frac{x}{\log x} + c$

(b)  $x \log(\log x) - \frac{x}{\log x} + c$

(c)  $x \log(\log x) + \frac{\log x}{x} + c$

(d)  $x \log(\log x) - \frac{\log x}{x} + c$

222. If  $f(x) = \begin{vmatrix} 0 & x^2 - \sin x & \cos x - 2 \\ \sin x - x^2 & 0 & 1 - 2x \\ 2 - \cos x & 2x - 1 & 0 \end{vmatrix}$ , then  $\int f(x) dx$  is equal to

(a)  $\frac{x^3}{3} - x^2 \sin x + \sin 2x$

(b)  $\frac{x^3}{3} - x^2 \sin x - \cos 2x$

(c)  $\frac{x^3}{3} - x^2 \cos x + \cos 2x$

(d) Constant

223. If integral of  $\frac{2 \sin x - \sin 2x}{x^3}$  ( $x \neq 0$ ) is  $g(x)$ , then  $\lim_{x \rightarrow 0} g'(x)$  will be equal to

(a) 1

(b) -1

(c) 0

(d) None of these

224. The value of  $\int e^{\sec x} \cdot \sec^3 x (\sin^2 x + \cos x + \sin x + \sin x \cos x) dx$  is

(a)  $e^{\sec x} (\sec^2 x + \sec x \cdot \tan x) + c$

(b)  $e^{\sec x} + c$

(c)  $e^{\sec x} (\sec x + \tan x) + c$

(d) None of these

225.  $\int e^{\tan^{-1} x} \left( 1 + \frac{x}{1+x^2} \right) dx$  is equal to

(a)  $x \cdot e^{\tan^{-1} x}$

(b)  $\frac{1}{2} x e^{\tan^{-1} x}$

(c)  $e^{\tan^{-1} x}$

(d)  $\frac{1}{2} e^{\tan^{-1} x}$

226.  $\int \sin 2x \cdot \log \cos x dx$  is equal to

(a)  $\cos^2 x \left( \frac{1}{2} + \log \cos x \right) + k$

(b)  $\cos^2 x \cdot \log x + k$

(c)  $\cos^2 x \left( \frac{1}{2} - \log \cos x \right) + k$

(d) None of these

227. If  $\int x \log(1+x^2) dx = \phi(x) \cdot \log(1+x^2) + \psi(x) + c$  then

(a)  $\phi(x) = \frac{1+x^2}{2}$

(b)  $\psi(x) = \frac{1+x^2}{2}$

(c)  $\psi(x) = -\frac{1+x^2}{2}$

(d)  $\phi(x) = -\frac{1+x^2}{2}$

228. If  $\int \frac{x \tan^{-1} x}{\sqrt{1+x^2}} dx = \sqrt{1+x^2} f(x) + A \log(x + \sqrt{x^2+1}) + c$ , then

(a)  $f(x) = \tan^{-1} x, A = -1$

(b)  $f(x) = \tan^{-1} x, A = 1$

(c)  $f(x) = 2 \tan^{-1} x, A = -1$

(d)  $f(x) = 2 \tan^{-1} x, A = 1$

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229.  $\int \frac{\sqrt{x^2+1}[\log(x^2+1)-2\log x]}{x^4} dx$  is equal to

(a)  $\frac{1}{3}\left(1+\frac{1}{x^2}\right)^{\frac{1}{2}}\left[\log\left(1+\frac{1}{x^2}\right)+\frac{2}{3}\right]+c$

(b)  $-\frac{1}{3}\left(1+\frac{1}{x^2}\right)^{\frac{3}{2}}\left[\log\left(1+\frac{1}{x^2}\right)-\frac{2}{3}\right]+c$

(c)  $\frac{2}{3}\left(1+\frac{1}{x^2}\right)^{\frac{3}{2}}\left[\log\left(1+\frac{1}{x^2}\right)+\frac{2}{3}\right]+c$

(d) None of these

230. If  $\int x \log\left(1+\frac{1}{x}\right)dx = f(x) \cdot \log(x+1) + g(x) \cdot x^2 + Ax + c$ , then

(a)  $f(x) = \frac{1}{2}x^2$

(b)  $g(x) = \log x$

(c)  $A = 1$

(d) None of these

231. If  $\int \frac{xe^x}{\sqrt{1+e^x}} dx = f(x)\sqrt{1+e^x} - 2\log g(x) + c$ , then

(a)  $f(x) = x - 1$

(b)  $g(x) = \frac{\sqrt{1+e^x}-1}{\sqrt{1+e^x}+1}$

(c)  $g(x) = \frac{\sqrt{1+e^x}+1}{\sqrt{1+e^x}-1}$

(d)  $f(x) = 2(x-2)$

232.  $\int \frac{\sin^{-1} x}{(1-x^2)^{\frac{3}{2}}} dx =$

[AISSE 1983, 87]

(a)  $\frac{x}{\sqrt{1-x^2}} \sin^{-1} x + \frac{1}{2} \log(1-x^2) + c$

(b)  $\frac{x}{\sqrt{1-x^2}} \sin^{-1} x - \frac{1}{2} \log(1-x^2) + c$

(c)  $\frac{1}{\sqrt{1-x^2}} \sin^{-1} x - \frac{1}{2} \log(1-x^2) + c$

(d)  $\frac{1}{\sqrt{1-x^2}} \sin^{-1} x + \frac{1}{2} \log(1-x^2) + c$

233. If  $\int f(x)dx = F(x)$ , then  $\int x^3 f(x^2)dx$  is equal to

(a)  $\frac{1}{2}\left[x^2 F(x^2) - \int F(x^2) d(x^2)\right]$

(b)  $\frac{1}{2}\left[x^2 F(x^2) - \int F(x^2) dx\right]$

(c)  $\frac{1}{2}\left[x^2 F(x) - \frac{1}{2} \int F(x^2) dx\right]$

(d) None of these

### Evaluation of the Various forms of Integrals by use of Standard Results

#### Basic Level

234.  $\int \frac{dx}{x^2+4x+13}$  is equal to

[Kerala CET 2002]

(a)  $\log(x^2+4x+13)+c$

(b)  $\frac{1}{3} \tan^{-1}\left(\frac{x+2}{3}\right)+c$

(c)  $\log(2x+4)+c$

(d)  $\frac{2x+4}{(x^2+4x+13)^2}+c$

235.  $\int \frac{dx}{x^2+8x+20} =$

[Pb. CET 1996]

(a)  $\tan^{-1}\left(\frac{x+4}{2}\right)+c$

(b)  $\frac{1}{2} \tan^{-1}\left(\frac{x+4}{2}\right)+c$

(c)  $-\tan^{-1}\left(\frac{x+4}{2}\right)+c$

(d)  $-\frac{1}{2} \tan^{-1}\left(\frac{x+4}{2}\right)+c$

236.  $\int \frac{dx}{1+x-x^2} =$

(a)  $\frac{1}{\sqrt{5}} \log \left[ \frac{\sqrt{5}-1+2x}{\sqrt{5}+1-2x} \right] + c$

(b)  $\frac{1}{\sqrt{5}} \log \left[ \frac{\sqrt{5}-1-2x}{\sqrt{5}+1+2x} \right] + c$

(c)  $-\frac{1}{\sqrt{5}} \log \left[ \frac{\sqrt{5}-1+2x}{\sqrt{5}+1-2x} \right] + c$

(d)  $-\frac{1}{\sqrt{5}} \log \left[ \frac{\sqrt{5}-1-2x}{\sqrt{5}+1+2x} \right] + c$

237. The value of  $\int \frac{dx}{3-2x-x^2}$  will be

[UPSEAT 1999]

(a)  $\frac{1}{4} \log \left( \frac{3+x}{1-x} \right)$

(b)  $\frac{1}{3} \log \left( \frac{3+x}{1-x} \right)$

(c)  $\frac{1}{2} \log \left( \frac{3+x}{1-x} \right)$

(d)  $\log \left( \frac{1-x}{3+x} \right)$

238. If  $\int \frac{2x+3}{x^2-5x+6} dx = 9 \ln(x-3) - 7 \ln(x-2) + A$ , then  $A =$

(a)  $5 \ln(x-2) + \text{constant}$

(b)  $-4 \ln(x-3) + \text{constant}$

(c) Constant

(d) None of these

239.  $\int \frac{x dx}{x^2+4x+5}$

[Rajasthan PET 2002]

(a)  $\frac{1}{2} \log(x^2+4x+5) + 2 \tan^{-1} x + c$

(b)  $\frac{1}{2} \log(x^2+4x+5) - \tan^{-1}(x+2) + c$

(c)  $\frac{1}{2} \log(x^2+4x+5) + \tan^{-1}(x+2) + c$

(d)  $\frac{1}{2} \log(x^2+4x+5) - 2 \tan^{-1}(x+2) + c$

240.  $\int \frac{2x-3}{x^2+3x-18} dx =$

(a)  $\log|x^2+3x-18| - \frac{2}{3} \log \left| \frac{x-3}{x+6} \right| + c$

(b)  $\log|x^2+3x-18| + \frac{2}{3} \log \left| \frac{x-3}{x+6} \right| + c$

(c)  $-\log|x^2+3x-18| - \frac{2}{3} \log \left| \frac{x-3}{x+6} \right| + c$

(d)  $-\log|x^2+3x-18| + \frac{2}{3} \log \left| \frac{x-3}{x+6} \right| + c$

241.  $\int \sqrt{x^2-8x+7} dx =$

(a)  $\frac{1}{2}(x-4)\sqrt{x^2-8x+7} + 9 \log[x-4+\sqrt{x^2-8x+7}] + c$

(b)  $\frac{1}{2}(x-4)\sqrt{x^2-8x+7} - 3\sqrt{2} \log[x-4+\sqrt{x^2-8x+7}] + c$

(c)  $\frac{1}{2}(x-4)\sqrt{x^2-8x+7} - \frac{9}{2} \log[x-4+\sqrt{x^2-8x+7}] + c$

(d) None of these

242.  $\int \frac{dx}{\sqrt{2x-x^2}} =$

[MP PET 1991; Karnataka CET 2002]

(a)  $\cos^{-1}(x-1) + c$

(b)  $\sin^{-1}(x-1) + c$

(c)  $\cos^{-1}(1+x) + c$

(d)  $\sin^{-1}(1-x) + c$

243.  $\int \frac{x^4+x^2+1}{x^2-x+1} dx =$

(a)  $\frac{1}{3}x^3 + \frac{1}{2}x^2 + x + c$

(b)  $\frac{1}{3}x^3 - \frac{1}{2}x^2 + x + c$

(c)  $\frac{1}{3}x^3 + \frac{1}{2}x^2 - x + c$

(d) None of these



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244.  $\int \frac{dx}{x[(\log x)^2 + 4 \log x - 1]} =$

(a)  $\frac{1}{2\sqrt{5}} \log \left[ \frac{\log x + 2 - \sqrt{5}}{\log x + 2 + \sqrt{5}} \right] + c$

(b)  $\frac{1}{\sqrt{5}} \log \left[ \frac{\log x + 2 - \sqrt{5}}{\log x + 2 + \sqrt{5}} \right] + c$

(c)  $\frac{1}{2\sqrt{5}} \log \left[ \frac{\log x + 2 + \sqrt{5}}{\log x + 2 - \sqrt{5}} \right] + c$

(d)  $\frac{1}{\sqrt{5}} \log \left[ \frac{\log x + 2 + \sqrt{5}}{\log x + 2 - \sqrt{5}} \right] + c$

245.  $\int \frac{dx}{7 + 5 \cos x} =$

[EAMCET 2002]

(a)  $\frac{1}{\sqrt{6}} \tan^{-1} \left( \frac{1}{\sqrt{6}} \tan \frac{x}{2} \right) + c$

(b)  $\frac{1}{\sqrt{3}} \tan^{-1} \left( \frac{1}{\sqrt{3}} \tan \frac{x}{2} \right) + c$

(c)  $\frac{1}{4} \tan^{-1} \left( \tan \frac{x}{2} \right) + c$

(d)  $\frac{1}{7} \tan^{-1} \left( \tan \frac{x}{2} \right) + c$

246.  $\int \frac{dx}{\sin x + \sqrt{3} \cos x} =$

(a)  $\log \tan \left( \frac{x}{2} + \frac{\pi}{2} \right) + c$

(b)  $\frac{1}{2} \log \tan \left( \frac{x}{2} + \frac{\pi}{6} \right) + c$

(c)  $\log \cot \left( \frac{x}{2} + \frac{\pi}{6} \right) + c$

(d)  $\frac{1}{2} \log \cot \left( \frac{x}{2} + \frac{\pi}{6} \right) + c$

247.  $\int \frac{dx}{1 - \sin x + \cos x} =$

[Pb. CET 1992]

(a)  $\log \left| 1 - \tan \frac{x}{2} \right| + c$

(b)  $-\log \left| 1 - \tan \frac{x}{2} \right| + c$

(c)  $\log \left| 1 + \tan \frac{x}{2} \right| + c$

(d) None of these

248.  $\int \frac{dx}{\sin x - \cos x + \sqrt{2}}$  equals

[MP PET 2002]

(a)  $-\frac{1}{\sqrt{2}} \tan \left( \frac{x}{2} + \frac{\pi}{8} \right) + c$

(b)  $\frac{1}{\sqrt{2}} \tan \left( \frac{x}{2} + \frac{\pi}{8} \right) + c$

(c)  $\frac{1}{\sqrt{2}} \cot \left( \frac{x}{2} + \frac{\pi}{8} \right) + c$

(d)  $-\frac{1}{\sqrt{2}} \cot \left( \frac{x}{2} + \frac{\pi}{8} \right) + c$

249.  $\int \frac{dx}{1 + 2 \sin x + \cos x} =$

[Rajasthan PET 1991]

(a)  $\log[1 + 2 \tan(x/2)] + c$

(c)  $\log[1 - 2 \tan(x/2)] + c$

(c)  $\frac{1}{2} \log[1 + 2 \tan(x/2)] + c$

(d) None of these

250.  $\int \frac{c^2 \sin 2x}{a^2 + b^2 \sin^2 x} dx =$

(a)  $\frac{c^2}{b^2} \log(a^2 + b^2 \sin^2 x) + k$

(b)  $\frac{c^2}{a^2} \log(a^2 + b^2 \sin^2 x) + k$

(c)  $\frac{b^2}{c^2} \log(a^2 + b^2 \sin^2 x) + k$

(d) None of these

251.  $\int \frac{1}{1 + \sin^2 x} dx =$

(a)  $\frac{1}{\sqrt{2}} \tan^{-1}(\sqrt{2} \tan x) + k$

(b)  $\sqrt{2} \tan^{-1}(\sqrt{2} \tan x) + k$

(c)  $-\frac{1}{\sqrt{2}} \tan^{-1}(\sqrt{2} \tan x) + k$

(d)  $-\sqrt{2} \tan^{-1}(\sqrt{2} \tan x) + k$

252.  $\int \frac{1}{1 + \cos^2 x} dx =$

(a)  $\frac{1}{\sqrt{2}} \tan^{-1}(\tan x) + c$

(b)  $\frac{1}{\sqrt{2}} \tan^{-1}\left(\frac{1}{2} \tan x\right) + c$

(c)  $\frac{1}{\sqrt{2}} \tan^{-1}\left(\frac{1}{\sqrt{2}} \tan x\right) + c$

(d) None of these

253.  $\int \frac{dx}{(a \sin x + b \cos x)^2} =$

- (a)  $\frac{1}{a(a \tan x + b)} + c$  (b)  $\frac{-1}{a(a \tan x + b)} + c$  (c)  $\frac{1}{a \tan x + b} + c$  (d)  $\frac{-1}{a \tan x + b} + c$

254.  $\int \frac{2 \sin x + 3 \cos x}{4 \sin x + 5 \cos x} dx$

- (a)  $\frac{2}{41} \log|5 \cos x + 4 \sin x| + \frac{23}{41} x + c$  (b)  $\frac{1}{2} \log|\sin x - \cos x| + \frac{1}{2} x + c$   
 (c)  $\frac{2}{13} \log|2 \sin x + 3 \cos x| + \frac{3}{13} x + c$  (d)  $\frac{1}{2} \log|\sin x + \cos x| + \frac{1}{2} x + c$

255.  $\int \frac{dx}{1 - \tan x} =$

[Pb. CET 1991, 93]

- (a)  $\frac{1}{2} x - \frac{1}{2} \log|\cos x - \sin x| + c$  (b)  $\frac{1}{2} x + \frac{1}{2} \log|\cos x + \sin x| + c$   
 (c)  $\frac{1}{2} x + \frac{1}{2} \log|\cos x - \sin x| + c$  (d) None of these

256.  $\int \frac{dx}{\cos x - \sin x}$  is equal to

[AIEEE 2004]

- (a)  $\frac{1}{\sqrt{2}} \log \left| \tan \left( \frac{x}{2} + \frac{3\pi}{8} \right) \right| + c$  (b)  $\frac{1}{\sqrt{2}} \log \left| \cot \left( \frac{x}{2} \right) \right| + c$  (c)  $\frac{1}{\sqrt{2}} \log \left| \tan \left( \frac{x}{2} - \frac{3\pi}{8} \right) \right| + c$  (d)  $\frac{1}{\sqrt{2}} \log \left| \tan \left( \frac{x}{2} - \frac{\pi}{8} \right) \right| + c$

257.  $\int \frac{3 \sin x + 2 \cos x}{3 \cos x + 2 \sin x} dx =$

- (a)  $\frac{12}{13} x - \frac{5}{13} \log(3 \cos x + 2 \sin x)$  (b)  $\frac{12}{13} x + \frac{5}{13} \log(3 \cos x + 2 \sin x)$   
 (c)  $\frac{13}{12} x + \frac{5}{13} \log(3 \cos x + 2 \sin x)$  (d) None of these

258.  $\int \frac{6x+7}{\sqrt{(x-5)(x-4)}} dx =$

- (a)  $6\sqrt{x^2 - 9x + 20} + 34 \log \left| x - \frac{9}{2} + \sqrt{x^2 - 9x + 20} \right| + c$  (b)  $6\sqrt{x^2 + 9x + 20} + 34 \log \left| x - \frac{9}{2} + \sqrt{x^2 + 9x + 20} \right| + c$   
 (c)  $6\sqrt{x^2 - 9x + 20} - 34 \log \left| x - \frac{9}{2} + \sqrt{x^2 - 9x + 20} \right| + c$  (d)  $6\sqrt{x^2 + 9x + 20} - 34 \log \left| x - \frac{9}{2} + \sqrt{x^2 + 9x + 20} \right| + c$

### Advance Level

259. The integral  $\int \frac{2x-3}{(x^2+x+1)^2} dx$  is equal to

- (a)  $-\frac{8x+7}{3(x^2+x+1)} - \frac{16}{3\sqrt{3}} \tan^{-1} \left( \frac{2x+1}{\sqrt{3}} \right) + c$  (b)  $-\frac{1}{x^2+x+1} - \frac{4}{3} \tan^{-1}(4x+3) + c$   
 (c)  $\frac{1}{2(x^2+x+1)} - \frac{(2x+1)^2}{(x^2+x+1)^2} + c$  (d)  $\frac{1}{4(x^2+x+1)} + \frac{2}{3} \tan^{-1}(2x+1) + c$

260. The value of the integral  $\int \frac{1+x^2}{1+x^4} dx$  is equal to

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- (a)  $\tan^{-1} x^2 + c$  (b)  $\frac{1}{\sqrt{2}} \tan^{-1} \left( \frac{x^2 - 1}{\sqrt{2x}} \right)$  (c)  $\frac{1}{2\sqrt{2}} \log \left( \frac{x^2 + \sqrt{2}x + 1}{x^2 - \sqrt{2}x + 1} \right) + c$  (d) None of these

261.  $\int \frac{x+2}{(x^2+3x+3)\sqrt{x+1}} dx$  is equal to

- (a)  $\frac{1}{\sqrt{3}} \tan^{-1} \left( \frac{x}{\sqrt{3(x+1)}} \right)$  (b)  $\frac{2}{\sqrt{3}} \tan^{-1} \left( \frac{x}{\sqrt{3(x+1)}} \right)$  (c)  $\frac{2}{\sqrt{3}} \tan^{-1} \left( \frac{x}{\sqrt{x+1}} \right)$  (d) None of these

262.  $\int \frac{dx}{(1+x^2)\sqrt{1-x^2}} =$

[MNR 1985]

- (a)  $\frac{1}{\sqrt{2}} \tan^{-1} \left[ \frac{\sqrt{1-x^2}}{x\sqrt{2}} \right] + c$  (b)  $\frac{1}{\sqrt{2}} \tan^{-1} \left[ \frac{x\sqrt{2}}{\sqrt{1-x^2}} \right] + c$  (c)  $\sqrt{2} \tan^{-1} \left[ \frac{\sqrt{1-x^2}}{x\sqrt{2}} \right] + c$  (d)  $-\sqrt{2} \tan^{-1} \left[ \frac{\sqrt{1-x^2}}{x\sqrt{2}} \right] + c$

## Integration of Rational functions by using Partial fractions

### Basic Level

263. Correct evaluation of  $\int \frac{x}{(x-2)(x-1)} dx$  is

[MP PET 1993]

- (a)  $\log_e \frac{(x-2)^2}{(x-1)} + p$  (b)  $\log_e \frac{(x-1)}{(x-2)} + p$  (c)  $\frac{x-1}{x-2} + p$  (d)  $2 \log_e \frac{(x-2)}{(x-1)} + p$

(where  $p$  is an arbitrary constant)

264.  $\int \frac{dx}{(x+1)(x+2)} =$

[MP PET 1987]

- (a)  $\log \frac{(x+2)}{(x+1)} + c$  (b)  $\log(x+1) + \log(x+2) + c$  (c)  $\log \frac{(x+1)}{(x+2)} + c$  (d) None of these

265.  $\int \frac{dx}{1-x^2} =$

[MP PET 1987, 92, 2000]

- (a)  $\tan^{-1} x + c$  (b)  $\sin^{-1} x + c$  (c)  $\frac{1}{2} \log \left| \frac{1+x}{1-x} \right| + c$  (d)  $\frac{1}{2} \log \left| \frac{1-x}{1+x} \right| + c$

266.  $\int \frac{x-1}{(x-3)(x-2)} dx =$

[Roorkee 1978]

- (a)  $\log(x-3) - \log(x-2) + c$  (b)  $\log(x-3)^2 - \log(x-2) + c$  (c)  $\log(x-3) + \log(x-2) + c$  (d)  $\log(x-3)^2 + \log(x-2) + c$

267.  $\int \frac{1}{x-x^3} dx =$

[MP PET 1996]

- (a)  $\frac{1}{2} \log \frac{(1-x^2)}{x^2} + c$  (b)  $\log \frac{(1-x)}{x(1+x)} + c$  (c)  $\log x(1-x^2) + c$  (d)  $\frac{1}{2} \log \frac{x^2}{(1-x^2)} + c$

268. If  $\int \frac{1}{(\sin x + 4)(\sin x - 1)} dx = A \frac{1}{\tan \frac{x}{2} - 1} + B \tan^{-1} f(x) + c$ , then

- (a)  $A = \frac{1}{5}, B = \frac{-2}{5\sqrt{15}}, f(x) = \frac{4 \tan x + 3}{\sqrt{15}}$  (b)  $A = -\frac{1}{5}, B = \frac{1}{\sqrt{15}}, f(x) = \frac{4 \tan \left( \frac{x}{2} \right) + 1}{\sqrt{15}}$

(c)  $A = \frac{2}{5}, B = \frac{-2}{5}, f(x) = \frac{4 \tan x + 1}{5}$

(d)  $A = \frac{2}{5}, B = \frac{-2}{5\sqrt{15}}, f(x) = \frac{4 \tan \frac{x}{2} + 1}{\sqrt{15}}$

269.  $\int \frac{dx}{(\sin x - 2 \cos x)(2 \sin x + \cos x)} =$

(a)  $\frac{1}{5} \log \left| \frac{\tan x - 2}{1 + 2 \tan x} \right| + c$  (b)  $-\frac{1}{5} \log \left| \frac{\tan x - 2}{1 + 2 \tan x} \right| + c$

(c)  $\log \left| \frac{\tan x - 2}{1 + 2 \tan x} \right| + c$

(d)  $-\log \left| \frac{\tan x - 2}{1 + 2 \tan x} \right| + c$

270.  $\int \frac{dx}{(x-1)^2(x-2)} =$

[CBSE PMT 1994]

(a)  $\log \left| \frac{x-2}{x-1} \right| + \frac{1}{x-1} + c$  (b)  $\log \left| \frac{x-1}{x-2} \right| + \frac{1}{x-1} + c$

(c)  $\log \left| \frac{x-2}{x-1} \right| - \frac{1}{x-1} + c$

(d)  $\log \left| \frac{x-1}{x-2} \right| - \frac{1}{x-1} + c$

271.  $\int \frac{x-1}{(x+1)^2} dx =$

(a)  $\log(x+1) + \frac{2}{x+1} + c$  (b)  $\log(x+1) - \frac{2}{x+1} + c$

(c)  $\frac{2}{x+1} - \log(x+1) + c$

(d) None of these

272.  $\int \frac{2x}{(2x+1)^2} dx =$

[DSSE 1985]

(a)  $\frac{1}{2} \log(2x+1) + \frac{1}{2(2x+1)} + c$

(b)  $\frac{1}{2} \log(2x+1) - \frac{1}{2(2x+1)} + c$

(c)  $2 \log(2x+1) + \frac{1}{2(2x+1)} + c$

(d)  $2 \log(2x+1) - \frac{1}{2(2x+1)} + c$

273.  $\int \frac{dx}{(x-x^2)} =$

[Roorkee 1982]

(a)  $\log x - \log(1-x) + c$  (b)  $\log(1-x)^2 + c$

(c)  $-\log x + \log(1-x) + c$

(d)  $\log(x-x^2) + c$

274. Value of  $\int \frac{x^2}{x^2-a^2} dx =$

[MNR 1997]

(a)  $x - \frac{a}{2} \log \left( \frac{x-a}{x+a} \right) + c$  (b)  $x + \frac{a}{2} \log \left( \frac{x-a}{x+a} \right) + c$

(c)  $x - \frac{a}{2} \log \left( \frac{x+a}{x-a} \right) + c$

(d)  $x + \frac{a}{2} \log \left( \frac{x+a}{x-a} \right) + c$

275.  $\int \frac{1}{(x-1)(x^2+1)} dx =$

[Roorkee 1984]

(a)  $\frac{1}{2} \log(x-1) - \frac{1}{4} \log(x^2+1) - \frac{1}{2} \tan^{-1} x + c$

(b)  $\frac{1}{2} \log(x-1) + \frac{1}{4} \log(x^2+1) - \frac{1}{2} \tan^{-1} x + c$

(c)  $\frac{1}{2} \log(x-1) - \frac{1}{2} \log(x^2+1) - \frac{1}{2} \tan^{-1} x + c$

(d) None of these

276. If  $\int \frac{2x+3}{(x-1)(x^2+1)} dx = \log_e \left\{ (x-1)^{\frac{5}{2}} (x^2+1)^a \right\} - \frac{1}{2} \tan^{-1} x + A$ , Where A is any arbitrary constant, then the value of 'a' is

[MP PET 1998]

(a)  $\frac{5}{4}$

(b)  $-\frac{5}{3}$

(c)  $-\frac{5}{6}$

(d)  $-\frac{5}{4}$

277.  $\int \frac{dx}{(x^2+1)(x^2+4)} =$

[MP PET 1995]

(a)  $\frac{1}{3} \tan^{-1} x - \frac{1}{3} \tan^{-1} \frac{x}{2} + c$

(b)  $\frac{1}{3} \tan^{-1} x + \frac{1}{3} \tan^{-1} \frac{x}{2} + c$

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- (c)  $\frac{1}{3} \tan^{-1} x - \frac{1}{6} \tan^{-1} \frac{x}{2} + c$  (d)  $\tan^{-1} x - 2 \tan^{-1} \frac{x}{2} + c$
278.  $\int \frac{x^2}{(x^2+2)(x^2+3)} dx =$  [AISSE 1990]
- (a)  $-\sqrt{2} \tan^{-1} x + \sqrt{3} \tan^{-1} x + c$  (b)  $-\sqrt{2} \tan^{-1} \frac{x}{\sqrt{2}} + \sqrt{3} \tan^{-1} \frac{x}{\sqrt{3}} + c$
- (c)  $\sqrt{2} \tan^{-1} \frac{x}{\sqrt{2}} + \sqrt{3} \tan^{-1} \frac{x}{\sqrt{3}} + c$  (d) None of these
279.  $\int \frac{1}{(x^2+a^2)(x^2+b^2)} dx =$
- (a)  $\frac{1}{(a^2-b^2)} \left[ \frac{1}{b} \tan^{-1} \left( \frac{x}{b} \right) - \frac{1}{a} \tan^{-1} \left( \frac{x}{a} \right) \right] + c$  (b)  $\frac{1}{(b^2-a^2)} \left[ \frac{1}{b} \tan^{-1} \left( \frac{x}{b} \right) - \frac{1}{a} \tan^{-1} \left( \frac{x}{a} \right) \right] + c$
- (c)  $\frac{1}{b} \tan^{-1} \left( \frac{x}{b} \right) - \frac{1}{a} \tan^{-1} \left( \frac{x}{a} \right) + c$  (d)  $\frac{1}{a} \tan^{-1} \left( \frac{x}{a} \right) - \frac{1}{b} \tan^{-1} \left( \frac{x}{b} \right) + c$
280.  $\int \frac{x dx}{(x^2-a^2)(x^2-b^2)} =$  [Roorkee 1976]
- (a)  $\frac{1}{(a^2-b^2)} \log \left( \frac{x^2-a^2}{x^2-b^2} \right) + c$  (b)  $\frac{1}{a^2-b^2} \log \left( \frac{x^2-b^2}{x^2-a^2} \right) + c$
- (c)  $\frac{1}{2(a^2-b^2)} \log \left( \frac{x^2-a^2}{x^2-b^2} \right) + c$  (d)  $\frac{1}{2(a^2-b^2)} \log \left( \frac{x^2-b^2}{x^2-a^2} \right) + c$
281. If  $\int \frac{(2x^2+1)dx}{(x^2-4)(x^2-1)} = \log \left[ \left( \frac{x+1}{x-1} \right)^a \left( \frac{x-2}{x+2} \right)^b \right] + c$ , then the values of  $a$  and  $b$  are respectively [Roorkee 2000]
- (a)  $\frac{1}{2}, \frac{3}{4}$  (b)  $-1, \frac{3}{2}$  (c)  $1, \frac{3}{2}$  (d)  $-\frac{1}{2}, \frac{3}{4}$
282. If  $\int \frac{2x^2+3}{(x^2-1)(x^2+4)} dx = a \log \left( \frac{x-1}{x+2} \right) + b \tan^{-1} \left( \frac{x}{2} \right) + c$ , then values of  $a$  and  $b$  are [Rajasthan PET 2000]
- (a)  $(1, -1)$  (b)  $(-1, 1)$  (c)  $\left( \frac{1}{2}, -\frac{1}{2} \right)$  (d)  $\left( \frac{1}{2}, \frac{1}{2} \right)$
283. For  $x > 1$ ,  $\int \frac{1}{x(x^4-1)} dx =$  [Rajasthan PET 1997, 89]
- (a)  $\log \frac{x^4-1}{x^4} + k$  (b)  $\frac{1}{4} \log \frac{x^4-1}{x^4} + k$  (c)  $\log \frac{x^4-1}{x} + k$  (d)  $\frac{1}{4} \log \frac{x^4-1}{x} + k$
284.  $\int \frac{dx}{e^x+1-2e^x} =$
- (a)  $\log(e^x-1) - \log(e^x+2) + c$  (b)  $\frac{1}{2} \log(e^x-1) - \frac{1}{3} \log(e^x+2) + c$
- (c)  $\frac{1}{3} \log(e^x-1) - \frac{1}{3} \log(e^x+2) + c$  (d)  $\frac{1}{3} \log(e^x-1) + \frac{1}{3} \log(e^x+2) + c$
285.  $\int \frac{x^2}{x^2+6x-3} dx =$  [AICBSE 1999]

$$(a) \quad x + 3 \log|x^2 + 6x - 3| + \frac{21}{4\sqrt{3}} \log \left| \frac{x+3-2\sqrt{3}}{x+3+2\sqrt{3}} \right| + c$$

$$(b) \quad x - 3 \log|x^2 + 6x - 3| + \frac{21}{4\sqrt{3}} \log \left| \frac{x+3-2\sqrt{3}}{x+3+2\sqrt{3}} \right| + c$$

$$(c) \quad x - 3 \log|x^2 + 6x - 3| - \frac{21}{4\sqrt{3}} \log \left| \frac{x+3-2\sqrt{3}}{x+3+2\sqrt{3}} \right| + c$$

(d) None of these

$$286. \quad \int \frac{e^x}{(1+e^x)(2+e^x)} dx =$$

$$(a) \quad \log[(1+e^x)(2+e^x)] + c \quad (b) \quad \log \left[ \frac{1+e^x}{2+e^x} \right] + c$$

$$(c) \quad \log[(1+e^x)\sqrt{2+e^x}] + c \quad (d) \quad \text{None of these}$$

### Advance Level

$$287. \quad \int \frac{x^3 - x - 2}{(1-x^2)} dx =$$

[AICBSE 1985]

$$(a) \quad \log \left( \frac{x+1}{x-1} \right) - \frac{x^2}{2} + c$$

$$(b) \quad \log \left( \frac{x-1}{x+1} \right) + \frac{x^2}{2} + c$$

$$(c) \quad \log \left( \frac{x+1}{x-1} \right) + \frac{x^2}{2} + c$$

$$(d) \quad \log \left( \frac{x-1}{x+1} \right) - \frac{x^2}{2} + c$$

$$288. \quad \int \frac{x^2 + x - 1}{x^2 + x - 6} dx =$$

[AISSE 1988]

$$(a) \quad x + \log(x+3) + \log(x-2) + c$$

$$(b) \quad x - \log(x+3) + \log(x-2) + c$$

$$(c) \quad x - \log(x+3) - \log(x-2) + c$$

(d) None of these

$$289. \quad \int \frac{dx}{1+x+x^2+x^3} =$$

[MP PET 1991]

$$(a) \quad \log \sqrt{1+x} - \frac{1}{2} \log \sqrt{1+x^2} + \frac{1}{2} \tan^{-1} x + c$$

$$(b) \quad \log \sqrt{1+x} - \log \sqrt{1+x^2} + \tan^{-1} x + c$$

$$(c) \quad \log \sqrt{1+x^2} - \log \sqrt{1+x} + \frac{1}{2} \tan^{-1} x + c$$

$$(d) \quad \log \sqrt{1+x} + \tan^{-1} x + \log \sqrt{1+x^2} + c$$

$$290. \quad \int \frac{x^3 - 1}{x^3 + x} dx =$$

[Roorkee 1988, MP PET 2001]

$$(a) \quad x - \log x + \frac{1}{2} \log(x^2 + 1) + \tan^{-1} x + c$$

$$(b) \quad x - \log x + \log \sqrt{x^2 + 1} - \tan^{-1} x + c$$

$$(c) \quad x + \log x + \log \sqrt{x^2 + 1} + \tan^{-1} x + c$$

(d) None of these

$$291. \quad \int \frac{(1+x)^3}{(1-x)^3} dx =$$

$$(a) \quad x + 6 \log|1-x| + \frac{12}{1-x} - \frac{4}{(1-x)^2} + c$$

$$(b) \quad -x + 6 \log|1-x| + \frac{12}{1-x} - \frac{4}{(1-x)^2} + c$$

$$(c) \quad -x - 6 \log|1-x| - \frac{12}{1-x} - \frac{4}{(1-x)^2} + c$$

(d) None of these

$$292. \quad \int \frac{dx}{x(x^5+1)} =$$

[CBSE 1997]

$$(a) \quad \frac{1}{5} \log \left| \frac{x^5}{x^5+1} \right| + c$$

$$(b) \quad 5 \log \left| \frac{x^5}{x^5+1} \right| + c$$

$$(c) \quad -\frac{1}{5} \log \left| \frac{x^5}{x^5+1} \right| + c$$

$$(d) \quad -5 \log \left| \frac{x^5}{x^5+1} \right| + c$$

$$293. \quad \text{If } \int \frac{4e^x + 6e^{-x}}{9e^x - 4e^{-x}} dx = Ax + B \log(9e^{2x} - 4) + C \text{ then A, B and C are}$$

[IIT 1990]

### 316 Indefinite Integral

- (a)  $A = \frac{3}{2}$ ,  $B = \frac{36}{35}$ ,  $C = \frac{3}{2} \log 3 + \text{constant}$  (b)  $A = \frac{3}{2}$ ,  $B = \frac{35}{36}$ ,  $C = \frac{3}{2} \log 3 + \text{constant}$
- (c)  $A = -\frac{3}{2}$ ,  $B = -\frac{35}{36}$ ,  $C = -\frac{3}{2} \log 3 + \text{constant}$  (d) None of these
294.  $\int \frac{x}{x^4 - 1} dx =$
- (a)  $\frac{1}{4} \log \left[ \frac{x^2 - 1}{x^2 + 1} \right] + c$  (b)  $\frac{1}{4} \log \left[ \frac{x^2 + 1}{x^2 - 1} \right] + c$  (c)  $\frac{1}{2} \log \left[ \frac{x^2 - 1}{x^2 + 1} \right] + c$  (d)  $\frac{1}{2} \log \left[ \frac{x^2 + 1}{x^2 - 1} \right] + c$
295.  $\int \frac{dx}{\sin x + \sin 2x} =$  [IIT 1984; J & KCET 1995]
- (a)  $\frac{1}{6} \log(1 - \cos x) + \frac{1}{2} \log(1 + \cos x) - \frac{2}{3} \log(1 + 2 \cos x) + c$  (b)  $6 \log(1 - \cos x) + 2 \log(1 + \cos x) - \frac{2}{3} \log(1 + 2 \cos x) + c$
- (c)  $6 \log(1 - \cos x) + \frac{1}{2} \log(1 + \cos x) + \frac{2}{3} \log(1 + 2 \cos x) + c$  (d) None of these
296. The value of  $\int \frac{\cos^3 x + \cos^5 x}{\sin^2 x + \sin^4 x} dx$  is
- (a)  $\sin x - 6 \tan^{-1}(\sin x) + c$  (b)  $\sin x - 2(\sin x)^{-1} + c$
- (c)  $\sin x - 2(\sin x)^{-1} - 6 \tan^{-1}(\sin x) + c$  (d)  $\sin x - 2(\sin x)^{-1} + 5 \tan^{-1}(\sin x) + c$

**Reduction formulae for some Special cases, Integration of form**  $\int \sin^m x \cos^n x dx, \int \sin mx \cos nx dx, \int \sin mx \sin nx dx, \int \cos mx \cos nx dx$

#### Basic Level

297.  $\int \tan^4 x dx =$
- (a)  $\tan^3 x - \tan x + x + c$  (b)  $\frac{1}{3} \tan^3 x - \tan x + x + c$  (c)  $\frac{1}{3} \tan^3 x + \tan x + x + c$  (d)  $\frac{1}{3} \tan^3 x + \tan x + 2x + c$
298. The value of  $\int \sec^3 x dx$  will be [UPSEAT 1999]
- (a)  $\frac{1}{2} [\sec x \tan x + \log(\sec x + \tan x)]$  (b)  $\frac{1}{3} [\sec x \tan x + \log(\sec x + \tan x)]$
- (c)  $\frac{1}{4} [\sec x \tan x + \log(\sec x + \tan x)]$  (d)  $\frac{1}{8} [\sec x \tan x + \log(\sec x + \tan x)]$
299.  $\int \sec^{2/3} x \cdot \operatorname{cosec}^{4/3} x dx =$
- (a)  $-3(\tan x)^{1/3} + c$  (b)  $-3(\tan x)^{-1/3} + c$  (c)  $3(\tan x)^{-1/3} + c$  (d)  $(\tan x)^{-1/3} + c$
300.  $\int \sin^4 x \cos^3 x dx =$  [CBSE 1985]
- (a)  $\frac{1}{5} \sin^5 x + \frac{1}{7} \sin^7 x + c$  (b)  $\frac{1}{5} \sin^5 x - \frac{1}{7} \sin^7 x + c$  (c)  $-\frac{1}{5} \sin^5 x + \frac{1}{7} \sin^7 x + c$  (d) None of these
301.  $\int \sin^3 x dx$  is equal to [SCRA 1996]
- (a)  $\sin^2 x + 1$  (b)  $\sin x^2 + x^2 + 1$  (c)  $\frac{\cos^3 x}{3} - \cos x$  (d)  $\frac{1}{4} \sin^4 x - \frac{3}{4} \sin^2 x$
302. Which value of constant not integration makes the value of integral of  $\sin 3x \cdot \cos 5x$  equal to zero at  $x = 0$  [Roorkee 1971]
- (a) 0 (b)  $-3/16$  (c)  $-5/6$  (d)  $1/8$
303.  $\int \sin 2x \cdot \sin 3x dx$  equals [Rajasthan PET 1989]

- (a)  $\frac{(\sin x - \sin 5x)}{2} + c$  (b)  $\frac{(\sin x - \sin 5x)}{10} + c$  (c)  $\frac{(5 \sin x - \sin 5x)}{10} + c$  (d) None of these.

304.  $\int \cos 2x \cdot \sin 4x dx$  equals

- (a)  $\frac{\cos 2x}{2} + \frac{\cos 6x}{6} + c$  (b)  $-\left(\frac{\cos 2x}{2} + \frac{\cos 6x}{6}\right) + c$  (c)  $-\left(\frac{\cos 2x}{4} + \frac{\cos 6x}{12}\right) + c$  (d) None of these.

305.  $\int \frac{\sin 5x}{\cos 7x \cdot \cos 2x} dx$  is equal to

- (a)  $\log|\sec 7x| + c$  (b)  $\log|\sec 7x \cdot \sec 2x| + c$  (c)  $\log|\sec 7x + \sec 2x| + c$  (d) None of these

306.  $\int \cos^5 x dx =$

- (a)  $\sin x - \frac{2}{3} \sin^3 x + \frac{1}{5} \sin^5 x + c$  (b)  $\sin x + \frac{2}{3} \sin^3 x + \frac{1}{5} \sin^5 x + c$   
 (c)  $\sin x - \frac{2}{3} \sin^3 x - \frac{1}{5} \sin^5 x + c$  (d) None of these

### Advance Level

307. If  $f(x) = \int \cot^4 x dx + \frac{1}{3} \cot^3 x - \cot x$  and  $f\left(\frac{\pi}{2}\right) = \frac{\pi}{2}$  then  $f(x) =$

- (a)  $\frac{\pi}{2} - x$  (b)  $x - \pi$  (c)  $\pi - x$  (d)  $x$

### Integration of Hyperbolic Functions

### Basic Level

308.  $\int \frac{dx}{1 + \cosh x} =$

- (a)  $\cot h\left(\frac{x}{2}\right) + c$  (b)  $\tan h\left(\frac{x}{2}\right) + c$  (c)  $\frac{1}{2} \tan h\left(\frac{x}{2}\right) + c$  (d) None of these

309.  $\int \frac{dx}{x\sqrt{(\log x)^2 - 3}}$  is equal to

- (a)  $\sinh^{-1}\left(\log \frac{x}{\sqrt{3}}\right) + c$  (b)  $\cosh^{-1}\left(\log \frac{x}{\sqrt{3}}\right) + c$  (c)  $\cosh^{-1}\left(\log \frac{x}{\sqrt{2}}\right) + c$  (d) None of these

310.  $\int \frac{(e^x + e^{-x})^2}{(e^x - e^{-x})^2} dx$  is equal to

- (a)  $2 \log(e^x - e^{-x}) + c$  (b)  $2 \log(e^x + e^{-x}) + c$  (c)  $x + \cot hx + c$  (d)  $x - \cot hx + c$

311.  $\int \frac{1}{x} \sqrt{\frac{x-1}{x+1}} dx$  equals

- (a)  $\cosh^{-1} x + \sec^{-1} x + c$  (b)  $\sinh^{-1} x - \sec^{-1} x + c$  (c)  $\cosh^{-1} x - \sec^{-1} x + c$  (d)  $\sinh^{-1} x + \sec^{-1} x + c$



### 318 Indefinite Integral

312.  $\int \sqrt{\sec x - 1} dx$  is equal to

- (a)  $2 \sin h^{-1} \left\{ \sqrt{2} \cos \left( \frac{x}{2} \right) \right\} + c$  (b)  $-2 \sin h^{-1} \left\{ \sqrt{2} \cos \left( \frac{x}{2} \right) \right\} + c$  (c)  $-2 \cos h^{-1} \left\{ \sqrt{2} \cos \left( \frac{x}{2} \right) \right\} + c$  (d) None of these

313.  $\int e^x (\sin hx + \cos hx) dx$  is equal to

[Karnataka CET 1993]

- (a)  $e^x \sec hx + c$  (b)  $e^x \cos hx + c$  (c)  $\sin h 2x + c$  (d)  $\cos h 2x + c$

### Integration of Surds like Expression

#### Basic Level

314.  $\int \frac{x^{5/2}}{\sqrt{1+x^7}} dx$  is

- (a)  $\frac{2}{7} \log(x^{7/2} + \sqrt{x^7 + 1}) + c$  (b)  $\frac{1}{2} \log \frac{x^7 + 1}{x^7 - 1} + c$  (c)  $2\sqrt{1+x^7} + c$  (d) None of these

315.  $\int \frac{dx}{x^{1/5}(1+x^{4/5})^{1/2}}$  is

- (a)  $\sqrt{1+x^{4/5}} + k$  (b)  $\frac{5}{2} \sqrt{1+x^{4/5}} + k$  (c)  $x^{4/5}(1+x^{4/5})^{1/2} + k$  (d) None of these

316.  $\int x^{-\frac{2}{3}}(1+x^{\frac{1}{2}})^{-\frac{5}{3}} dx$  is equal to

- (a)  $3(1+x^{-1/2})^{-1/3} + c$  (b)  $3(1+x^{-1/2})^{-2/3} + c$  (c)  $3(1+x^{1/2})^{-2/3} + c$  (d) None of these

317. The value of  $\int \frac{(x-x^3)^{1/3}}{x^4} dx$  is

- (a)  $\frac{3}{8} \left( \frac{1}{x^2} - 1 \right)^{\frac{4}{3}} + c$  (b)  $-\frac{3}{8} \left( \frac{1}{x^2} - 1 \right)^{\frac{4}{3}} + c$  (c)  $\frac{1}{8} \left( 1 - \frac{1}{x^2} \right)^{\frac{4}{3}} + 1$  (d) None of these

318.  $\int \frac{(x^4 - x)^{1/4}}{x^5} dx$  is equal to

- (a)  $\frac{4}{15} \left( 1 - \frac{1}{x^3} \right)^{\frac{5}{4}} + c$  (b)  $\frac{4}{5} \left( 1 - \frac{1}{x^3} \right)^{\frac{5}{4}} + c$  (c)  $\frac{4}{15} \left( 1 + \frac{1}{x^3} \right)^{\frac{5}{4}} + c$  (d) None of these

319. If  $\int \frac{1}{x\sqrt{1-x^3}} dx = a \log \left| \frac{\sqrt{1-x^2}-1}{\sqrt{1-x^2}+1} \right| + b$ , then  $a$  is equal to

- (a)  $\frac{1}{3}$  (b)  $\frac{2}{3}$  (c)  $-\frac{1}{3}$  (d)  $-\frac{2}{3}$

#### Advance Level

320.  $\int \frac{1}{[(x-1)^3(x+2)^5]^{1/4}} dx$  is equal to
- (a)  $\frac{4}{3} \left( \frac{x-1}{x+2} \right)^{\frac{1}{4}} + c$  (b)  $\frac{4}{3} \left( \frac{x+2}{x-1} \right)^{\frac{1}{4}} + c$  (c)  $\frac{1}{3} \left( \frac{x-1}{x+2} \right)^{\frac{1}{4}} + c$  (d)  $\frac{1}{3} \left( \frac{x+2}{x-1} \right)^{\frac{1}{4}} + c$
321.  $\int \frac{1}{(1+x^2)\sqrt{1-x^2}} dx$  is equal to
- (a)  $\frac{1}{2} \tan^{-1} \left( \frac{\sqrt{2}x}{\sqrt{1-x^2}} \right)$  (b)  $\frac{1}{\sqrt{2}} \tan^{-1} \left( \frac{\sqrt{2}x}{\sqrt{1+x^2}} \right)$  (c)  $\frac{1}{\sqrt{2}} \tan^{-1} \left( \frac{\sqrt{2}x}{\sqrt{1-x^2}} \right)$  (d) None of these
322. Let  $f(x) = \int \frac{x^2 dx}{(1+x^2)(1+\sqrt{1+x^2})}$  and  $f(0) = 0$ , then  $f(1)$  is
- (a)  $\log(1+\sqrt{2})$  (b)  $\log(1+\sqrt{2}) - \frac{\pi}{4}$  (c)  $\log(1+\sqrt{2}) + \frac{\pi}{4}$  (d) None of these
323. Let  $\int \frac{x^{1/2}}{\sqrt{1-x^3}} dx = \frac{2}{3} g \circ f(x) + c$ , then
- (a)  $f(x) = \sqrt{x}$  (b)  $f(x) = x^{3/2}$  (c)  $f(x) = x^{2/3}$  (d)  $g(x) = \sin^{-1} x$
- (e) Both b and d
324.  $\int \frac{dx}{\sqrt{x+x\sqrt{x}}}$  is equal to
- (a)  $\log \sqrt{x+x\sqrt{x}} + c$  (b)  $\sqrt{1+\sqrt{x}} + c$  (c)  $4\sqrt{1+\sqrt{x}} + c$  (d) None of these
325.  $\int \frac{x^4 - 1}{x^2 \sqrt{x^4 + x^2 + 1}} dx =$
- (a)  $\sqrt{x^2 + \frac{1}{x^2} + 1}$  (b)  $\frac{\sqrt{x^4 + x^2 + 1}}{x}$  (c)  $\sqrt{\frac{x^4 + x^2 + 1}{x}}$  (d) Both a and b
326.  $\int \frac{dx}{(x+\alpha)^{8/7}(x-\beta)^{6/7}} =$
- (a)  $\frac{6}{\alpha+\beta} \left( \frac{x-\beta}{x+\alpha} \right)^{\frac{1}{6}}$  (b)  $\frac{6}{\alpha+\beta} \left( \frac{x+\alpha}{x-\beta} \right)^{\frac{1}{6}}$  (c)  $\frac{7}{\alpha+\beta} \left( \frac{x+\alpha}{x-\beta} \right)^{\frac{1}{7}}$  (d)  $\frac{7}{\alpha+\beta} \left( \frac{x-\beta}{x+\alpha} \right)^{\frac{1}{7}}$
327.  $\int \frac{x dx}{(x^2+1)^{4/5}(x^2+2)^{6/5}} =$
- (a)  $\frac{2}{5} \left( \frac{x^2+2}{x^2+1} \right)^{\frac{1}{5}}$  (b)  $\frac{5}{2} \left( \frac{x^2+2}{x^2+1} \right)^{-\frac{1}{5}}$  (c)  $\frac{5}{2} \left( \frac{x^2+1}{x^2+2} \right)^{\frac{1}{5}}$  (d) Both (b) and (c)

# Answer Sheet

### Assignment (Basic and Advance Level)

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
| d   | b   | a   | b   | b   | c   | b   | c   | c   | b   | a   | c   | c   | c   | a   | a   | a   | a   | d   | a   |
| 21  | 22  | 23  | 24  | 25  | 26  | 27  | 28  | 29  | 30  | 31  | 32  | 33  | 34  | 35  | 36  | 37  | 38  | 39  | 40  |
| b   | b   | b   | a   | c   | a   | d   | c   | d   | d   | d   | a   | a   | b   | d   | b   | d   | a   | b   | d   |
| 41  | 42  | 43  | 44  | 45  | 46  | 47  | 48  | 49  | 50  | 51  | 52  | 53  | 54  | 55  | 56  | 57  | 58  | 59  | 60  |
| a   | b   | a   | a   | c   | a   | c   | d   | a   | c   | c   | b   | c   | a   | d   | d   | b   | a   | c   | b   |
| 61  | 62  | 63  | 64  | 65  | 66  | 67  | 68  | 69  | 70  | 71  | 72  | 73  | 74  | 75  | 76  | 77  | 78  | 79  | 80  |
| c   | a   | b   | c   | b   | c   | a   | b   | b,c | b   | c   | c   | c   | a   | c   | a   | b   | d   | a   | a   |
| 81  | 82  | 83  | 84  | 85  | 86  | 87  | 88  | 89  | 90  | 91  | 92  | 93  | 94  | 95  | 96  | 97  | 98  | 99  | 100 |
| b   | c   | c   | c   | b   | a   | d   | b   | d   | b   | c   | c   | a   | a   | b   | a   | b   | a   | b   | c   |
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 |
| c   | b   | a   | a   | a   | b   | b   | b   | a   | a   | b   | a   | d   | a   | c   | a   | a   | c   | a   | b   |
| 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 |
| c   | b   | b   | c   | a   | b   | b   | b   | b   | d   | d   | d   | a   | a   | b   | a   | a   | c   | a   | c   |
| 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 |
| d   | b   | a   | c   | c   | c   | a   | b   | b   | c   | b   | a   | a   | b   | c   | d   | b   | a   | b   | b   |
| 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 |
| b   | c   | a   | a   | b   | a   | a   | a   | b   | b   | b   | a   | a   | c   | a   | a   | b   | c   | d   | d   |
| 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 |
| b   | b   | b   | d   | c   | b   | b   | c   | c   | b   | a   | c   | c   | b   | d   | a   | b   | a   | c   | c   |
| 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 |
| a   | c   | a   | a   | b   | c   | a   | a   | a   | c   | d   | d   | c   | b   | b   | a   | a   | d   | d   | b   |
| 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 |
| d   | d   | c   | a   | c   | a   | a   | b   | d   | b,d | a   | a   | b   | b   | b   | a   | c   | d   | a   | c   |
| 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 |
| b   | a   | a   | a   | a   | b   | b   | d   | c   | a   | a   | c   | b   | a   | a   | a   | a   | a   | a   | b   |
| 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 |
| b   | b   | a   | c   | c   | b   | d   | d   | a   | a   | a   | a   | a   | b   | a   | d   | c   | b   | a   | c   |
| 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 |
| a   | d   | b   | c   | b   | b   | d   | b   | a   | b   | c   | a   | d   | a   | a   | c   | b   | a   | b   | b   |
| 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 |
| c   | b   | c   | c   | d   | a   | d   | b   | b   | d   | c   | c   | b   | a   | b   | b   | b   | a   | a   | a   |
| 321 | 322 | 323 | 324 | 325 | 326 | 327 |     |     |     |     |     |     |     |     |     |     |     |     |     |
| c   | b   | e   | c   | d   | d   | d   |     |     |     |     |     |     |     |     |     |     |     |     |     |