PHYSICS

DPP

DAILY PRACTICE PROBLEMS

DPP No. 3

Total Marks : 31

Max. Time : 32 min.

Topic : Mathematical Tools

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.7	(3 marks, 3 min.)	[21, 21]
Subjective Questions ('–1' negative marking) Q.8	(4 marks, 5 min.)	[4, 5]
Comprehension Questions ('–1' negative marking) Q.9 to Q.10	(3 marks, 3 min.)	[6, 6]

1. If $y = \sin(x) + \ln(x^2) + e^{2x}$ then $\frac{dy}{dx}$ will be :

(A) $\cos x + \frac{2}{x} + e^{2x}$ (B) $\cos x + \frac{2}{x} + 2e^{2x}$ (C) $-\cos x + \frac{2}{x^2} + e^{2x}$ (D) $-\cos x - \frac{2}{x^2} + 2e^{2x}$

2. If $y = e^x \cdot \cot x$ then $\frac{dy}{dx}$ will be

(A) $e^x\cot x - \text{cosec}^2x$ (B) $e^x \text{cosec}^2x$ (C) $e^x[\cot x - \text{cosec}^2x]$ (D) $e^x\cot x$

3. If $y = x\ \ell nx$ then $\frac{dy}{dx}$ will be

(A) $\ell nx + x$ (B) $1 + \ell n\ x$ (C) ℓnx (D) 1

4. If $y = \frac{\ell nx}{x}$ then $\frac{dy}{dx}$ will be :

(A) $\frac{1-\ell nx}{x}$ (B) $\frac{1+\ell nx}{x^2}$ (C) $\frac{1-\ell nx}{x^2}$ (D) $\frac{\ell nx-1}{x^2}$

5. Differentiation of $\sin(x^2 + 3)$ w.r.t. x is -

(A) $\cos(x^2 + 3)$ (B) $2x\cos(x^2 + 3)$ (C) $(x^2 + 3)\cos(x^2 + 3)$ (D) $2x\cos(2x + 3)$

6. If $y = x^2 \sin x$, then $\frac{dy}{dx}$ will be -

(A) $x^2\cos x + 2x\sin x$ (B) $2x\sin x$ (C) $x^2\cos x$ (D) $2x\cos x$

7. If $y = \tan x \cdot \cos^2x$ then $\frac{dy}{dx}$ will be -

(A) $1 + 2\sin^2x$ (B) $1 - 2\sin^2x$ (C) 1 (D) $2\sin^2x$

8. $y = (2x + 3)^4 - (7x - 1)^2 + \frac{2}{(3x+1)^3} + \frac{4}{(4x-3)^2}$. Find $\frac{dy}{dx}$

COMPREHENSION

If a function is written as :

$y_1 = \sin(4x^2)$ & another function is $y_2 = \ln(x^3)$ then :

9. $\frac{dy_1}{dx}$, will be :

(A) $8x\cos(4x^2)$ (B) $\cos(4x^2)$ (C) $-\cos(4x^2)$ (D) $-8x\cos(4x^2)$

10. $\frac{dy_2}{dx}$ will be

(A) $\frac{1}{x^3}$ (B) $\frac{3}{x}$ (C) $-\frac{1}{x^3}$ (D) $\frac{3}{x^2}$

Answers Key

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1. (B) **2.** (C) **3.** (B) **4.** (C) **5.** (B)
6. (A) **7.** (B)

8. $\frac{dy}{dx} = 8(2x+3)^3 - 14(7x-1) - \frac{18}{(3x+1)^4} - \frac{32}{(4x-3)^3}$.

9. (A) **10.** (B)

Hint & Solutions

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1. $y = \sin x + \ell n x^2 + e^{2x}$

$$\frac{dy}{dx} = \cos x + \frac{2x}{x^2} + 2e^{2x}$$

$$= \cos x + \frac{2}{x} + 2e^{2x}$$

2. $y = e^x \cdot \cot x$

$$\frac{dy}{dx} = e^x \frac{d}{dx}(\cot x) + \cot x \frac{d}{dx}(e^x)$$

$$= e^x(-\text{cosec}^2 x) + \cot x\, e^x$$
$$= e^x[\cot x - \text{cosec}^2 x]$$

3. $y = x\ell n x$

$$\frac{dy}{dx} = x\frac{d}{dx}\ell n x + \ell n x \frac{d}{dx}(x)$$

$$= x\left(\frac{1}{x}\right) + \ell n x$$

$$= 1 + \ell n x$$

4. $y = \frac{\ell n x}{x}$

$$\frac{dy}{dx} = \frac{x\frac{d}{dx}(\ell n x) - \ell n x \frac{d}{dx}(x)}{x^2}$$

$$= \frac{x(1/x) - \ell n x}{x^2}$$

$$\frac{dy}{dx} = \frac{1 - \ell n x}{x^2}$$

5. $y = \sin (x^2 + 3)$

$$\frac{dy}{dx} = \cos (x^2 + 3)\,(2x + 0)$$

$$= 2x \cos (x^2 + 3)$$

6. $y = x^2 \sin x$

$$\frac{dy}{dx} = x^2 \frac{d}{dx} \sin x + \sin x \frac{d}{dx} (x^2)$$

$$= x^2 \cos x + 2x \sin x$$

7. $y = \tan x \cos^2 x$

$$\frac{dy}{dx} = \tan x \frac{d}{dx} (\cos^2 x) + \cos^2 x \frac{d}{dx} (\tan x)$$

$$= \tan x\,(-2) \cos x \sin x + \cos^2 x \sec^2 x$$

$$= 1 - 2 \sin^2 x$$

Alter : $y = \frac{\sin x}{\cos x} \times \cos^2 x = \sin x \cos x$

$$y = \frac{1}{2} \sin 2x$$

$$\frac{dy}{dx} = \frac{1}{2} \times 2 \cos 2x$$

$$= \cos 2x$$

$$= 1 - 2 \sin^2 x$$

8. $y = (2x + 3)^4 - (7x - 1)^2 + \frac{2}{(3x+1)^3} + \frac{4}{(4x-3)^2}$

$$\frac{dy}{dx} = = 4(2x + 3)^3 \times 2 - 2(7x - 1) \times 7 + 2\,(-3)$$

$$\times (3x + 1)^{-4} \times 3 + 4 \times (-2) \times (4x - 3)^{-3} \times 4$$

9. $y_1 = \sin 4x^2$,

$$\frac{dy_1}{dx} = \cos 4x^2\,(8x) = 8x \cos 4x^2$$

10. $y_2 = \ell n x^3 \quad \Rightarrow \quad \frac{dy_2}{dx} = \frac{3x^2}{x^3} = \frac{3}{x}$