

Topic : Mathematical Tools

Type of Questions

Single choice Objective ('-1' negative marking) Q.1 to Q.7

(3 marks, 3 min.)

M.M., Min.

[21, 21]

Multiple choice Objective ('-1' negative marking) Q.8

(4 marks, 4 min.)

[4, 4]

Subjective Questions ('-1' negative marking) Q.9 to Q.10

(4 marks, 5 min.)

[8, 10]

1. Double differentiation of displacement w.r.t. time is :
(A) acceleration (B) velocity (C) force (D) none
2. If $y = x^3$ then $\frac{d^2y}{dx^2}$ is -
(A) $6x^2$ (B) $6x$ (C) $3x^2$ (D) $3x$
3. If $Q = 4v^3 + 3v^2$, then the value of 'v' such that, there exist maxima of 'Q' -
(A) 0 (B) $-\frac{1}{2}$ (C) $\frac{1}{2}$ (D) none
4. If $y = 2 \sin^2 \theta + \tan \theta$ then $\frac{dy}{d\theta}$ will be -
(A) $4 \sin \theta \cos \theta + \sec \theta \tan \theta$ (B) $2 \sin 2 \theta + \sec^2 \theta$
(C) $4 \sin \theta + \sec^2 \theta$ (D) $2 \cos^2 \theta + \sec^2 \theta$
5. $\int x^3 dx$ is equal to :
(A) $3x^2$ (B) $\frac{x^4}{4} + C$ (C) $\frac{x^4}{4}$ (D) $4x^3$
6. $\int 2 \sin(x) dx$ is equal to :
(A) $-2 \cos x + C$ (B) $2 \cos x + C$ (C) $-2 \cos x$ (D) $2 \cos x$
7. If $y = \sin x$, then $\frac{d^2y}{dx^2}$ will be :
(A) $\cos x$ (B) $\sin x$ (C) $-\sin x$ (D) $\sin x + C$
8. Which of the following has value zero ?
(A) $\sin 0^\circ$ (B) $\tan 0^\circ$ (C) $\cos 0^\circ$ (D) $\cot 0^\circ$
9. $y = x(c - x)$ where c is a constant. Find maximum value of y.
10. If $y = 4 \cos 4x$ find $\int y dx$

Answers Key

DPP NO. - 4

1. (A) 2. (B) 3. (B) 4. (B)
5. (B) 6. (A) 7. (C) 8. (A), (B)
9. $\frac{c^2}{4}$ 10. $\sin 4x + C$

Hint & Solutions

DPP NO. - 4

1. $\frac{dx}{dt} = v \Rightarrow \frac{d^2x}{dt^2} = \text{acceleration}$

2. $y = x^3$

$$\frac{dy}{dx} = 3x^2 \quad \frac{d^2y}{dx^2} = 6x$$

3. $Q = 4V^3 + 3V^2$

$$\frac{dQ}{dv} = 12V^2 + 6V$$

$$\frac{dQ}{dv} = 0 \Rightarrow V = 0, -\frac{1}{2}$$

$$\frac{d^2Q}{dV^2} = 24V + 6 \Rightarrow \left(\frac{d^2Q}{dV^2} \right)_{V=0} = 6 \text{ (+ve)}$$

$$\left(\frac{d^2Q}{dV^2} \right)_{V=-1/2} = -12 + 6 = -6 \text{ (-ve)}$$

$V = -1/2$ for maximum Q

4. $y = 2\sin^2\theta + \tan\theta$

$$\frac{dy}{d\theta} = 2 \times 2 \sin\theta \cos\theta + \sec^2\theta$$

$$= 2 \sin 2\theta + \sec^2\theta$$

5. $\int x^3 dx = \frac{x^4}{4} + C$

6. $\int 2\sin(x) dx = -2 \cos x + C$

7. $y = \sin x$

$$\frac{dy}{dx} = \cos x$$

$$\frac{d^2y}{dx^2} = -\sin x$$

8. $\sin 0^\circ = 0$
 $\tan 0^\circ = 0$

9. $\frac{dy}{dx} = C - 2x = 0 \Rightarrow x = \frac{C}{2}$

$$\frac{d^2y}{dx^2} = -2$$

$$Y_{\max} = \frac{C}{2} \left(C - \frac{C}{2} \right) = \frac{C^2}{4}$$

10. $y = 4 \cos 4x$

$$\int y dx = \int 4 \cos t \frac{dt}{4}$$

$$4x = t$$

$$4dx = dt$$

$$dx = \frac{dt}{4}$$

$$\int 4 \cos t \frac{dt}{4} = \sin t = \sin 4x$$