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# **IIT JEE**

# **Physics DPP**

**DPP-4 Basic mathematics ( Differentiations-1)**

**By Physicsaholics Team**

Q) What is the derivative of a constant?

(a) 1

(c)  $\infty$

(b) zero

(d) cannot be determined

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Ans. b

$$y = k,$$

where  $k = \text{constant}$

$$\frac{dy}{dx} = \frac{d}{dx}(k)$$

$$\boxed{\frac{dy}{dx} = 0}$$



Q) Find the derivative of the function:  $F(x) = 6x^3 - 9x + 4$ , w.r.t. 'x':

(a)  $F'(x) = 18x^2 + 9$

(b)  $F'(x) = 6x^2 - 9x$

(c)  $F'(x) = 18x^2 - 9$

(d) None of these

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Ans. c

$$f(x) = 6x^3 - 9x + 4$$

$$\text{So, } \frac{d}{dx}(f(x)) = f'(x) = 6(3x^2) - 9(1) + 0$$

$$\boxed{f'(x) = 18x^2 - 9}$$

Q) Find the derivative of the function:  $F(x) = 10\sqrt[5]{x^3} - \sqrt{x^7} + 6\sqrt[3]{x^8} - 3$ , w.r.t. 'x':

(a)  $F'(x) = 6x^{-\frac{2}{5}} - \frac{7}{2}x^{\frac{5}{2}} + 16x^{\frac{5}{3}}$

(b)  $F'(x) = 10x^{-\frac{2}{5}} - \frac{1}{2}x^{\frac{5}{2}} + 6x^{\frac{5}{3}}$

(c)  $F'(x) = 6x^{-\frac{5}{2}} - \frac{7}{2}x^{\frac{7}{2}} + 16x^{\frac{8}{3}}$

(d) None of these

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Ans. a

$$F(x) = 10 \sqrt[5]{x^3} - \sqrt{x^7} + 6 \sqrt[3]{x^8} - 3$$

$$F(x) = 10 x^{3/5} - x^{7/2} + 6 x^{8/3} - 3$$

$$\text{So, } \frac{d}{dx}(F(x)) = F'(x)$$

$$\begin{aligned} F'(x) &= 10 \left( \frac{3}{5} x^{\frac{3}{5}-1} \right) - \frac{7}{2} (x^{\frac{7}{2}-1}) + 6 \left( \frac{8}{3} x^{\frac{8}{3}-1} \right) - 0 \\ &= 6 x^{-\frac{2}{5}} - \frac{7}{2} x^{\frac{5}{2}} + 16 x^{5/3} \end{aligned}$$

$$\boxed{F'(x) = 6 x^{-\frac{2}{5}} - \frac{7}{2} x^{\frac{5}{2}} + 16 x^{5/3}}$$

Q) What is the derivative of  $\cos x$  w.r.t. 'x'?

(a)  $\cos x$

(b)  $-\tan x$

(c)  $\sin x$

(d)  $-\sin x$

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Ans. d



$$y = \cos x$$

$$\frac{dy}{dx} = -\sin x$$

Q) Differentiate w.r.t. 'x' if  $y = 3 \sin x - 2$

(a)  $\frac{dy}{dx} = 3$

(b)  $\frac{dy}{dx} = 3 \cos x$

(c)  $\frac{dy}{dx} = 3 \cos x - 2$

(d)  $\frac{dy}{dx} = 3 \sin x$

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Ans. b

$$y = 3 \sin x - 2$$

$$\frac{dy}{dx} = 3 (\cos x) - 0$$

$$\boxed{\frac{dy}{dx} = 3 \cos x}$$

Q) Differentiate w.r.t. 'x' if  $y = 15 \sin x - 2e^x - \frac{1}{2}x^2 + 5$

(a)  $\frac{dy}{dx} = 15 \cos x - 2xe^x - 2x$

(b)  $\frac{dy}{dx} = 15 \cos x - 2e^x - x$

(c)  $\frac{dy}{dx} = 15 \cos x - 2$

(d)  $\frac{dy}{dx} = 15 \sin x - 2e^x - 2x$

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Ans. b

$$y = 15 \sin x - 2e^x - \frac{1}{2}x^2 + 5$$

$$\frac{dy}{dx} = 15(\cos x) - 2e^x - \frac{1}{2}(2x) + 0$$

$$\boxed{\frac{dy}{dx} = 15 \cos x - 2e^x - x}$$



Q) Differentiate w.r.t. 'x' if  $y = 2 \ln x - 2x^2 - 3 \cos x + 1$

(a)  $\frac{dy}{dx} = 2e^x - 4x - 3 \sin x$

(b)  $\frac{dy}{dx} = \frac{2}{x} - 4x - 3 \sin x$

(c)  $\frac{dy}{dx} = 2e^x - 4x + 3 \sin x$

(d)  $\frac{dy}{dx} = \frac{2}{x} - 4x + 3 \sin x$

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Ans. d

$$y = \cos x - 2x$$

$$\frac{dy}{dx} = -\sin x - 2$$

$$\therefore \frac{d}{dx}(\cos x) = -\sin x$$

Q) Differentiate w.r.t. 'x' if  $y = \cos x - 2x$

(a)  $\frac{dy}{dx} = \cos x - 2$

(b)  $\frac{dy}{dx} = \sin x - 2$

(c)  $\frac{dy}{dx} = -\sin x - 2$

(d) None of these

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Ans. c

$$y = 2 \ln x - 2x^2 - 3 \cos x + 1$$

$$\frac{dy}{dx} = 2 \left( \frac{1}{x} \right) - 4x - 3(-\sin x) + 0$$

$$\boxed{\frac{dy}{dx} = \frac{2}{x} - 4x + 3 \sin x}$$

Q) Differentiate w.r.t. 'x' if  $y = x^{\frac{5}{2}} + \ln x + 2 \sin x$

(a)  $\frac{dy}{dx} = \frac{5}{2} x^{\frac{3}{2}} + \frac{1}{x} + 2 \cos x$

(b)  $\frac{dy}{dx} = \frac{5}{2} x^{\frac{3}{2}} - \frac{1}{x} - 2 \cos x$

(c)  $\frac{dy}{dx} = x^{\frac{3}{2}} + \frac{1}{x} + 2 \cos x$

(d)  $\frac{dy}{dx} = x^{\frac{3}{2}} + \frac{1}{x} - 2 \cos x$

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Ans. a

$$y = x^{5/2} + \ln x + 2 \sin x$$

$$\frac{dy}{dx} = \frac{5}{2} x^{5/2-1} + \frac{1}{x} + 2(\cos x)$$

$$\boxed{\frac{dy}{dx} = \frac{5}{2} x^{3/2} + \frac{1}{x} + 2 \cos x}$$

Q) Differentiate w.r.t. 'x' if  $y = \sin x - \cos x + \ln\left(\frac{1}{x}\right)$

(a)  $\frac{dy}{dx} = \cos x - \sin x + \frac{1}{x}$

(b)  $\frac{dy}{dx} = \cos x + \sin x + \frac{1}{x}$

(c)  $\frac{dy}{dx} = \cos x + \sin x - \frac{1}{x}$

(d) None of these

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Ans. c

$$y = \sin x - \cos x + \ln\left(\frac{1}{x}\right)$$

$$y = \sin x - \cos x + \ln(x^{-1})$$

$$y = \sin x - \cos x - \ln(x)$$

$$\frac{dy}{dx} = \frac{d}{dx}(\sin x - \cos x - \ln x)$$

$$= \cos x - (-\sin x) - \left(\frac{1}{x}\right)$$

$$\boxed{\frac{dy}{dx} = \cos x + \sin x - \frac{1}{x}}$$

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