PHYSICS

Q.1 $\frac{d}{dx}\sqrt{\sin 2x}$

(A) $(\sin 2x)^{-1/2}$ (B) $\cos 2x\,(\sin 2x)^{-1/2}$

(C) $2\cos 2x\,(\sin 2x)^{-1/2}$ (D) $\cos 2x\,(\sin 2x)^{1/2}$

[B]

Q.2 $\frac{d}{dx}\sqrt{\tan x}$

(A) $2\sec^2 x\,(\tan x)^{-1/2}$ (B) $\frac{1}{2}\sec^2 x\,(\tan x)^{-1/2}$

(C) $\frac{1}{2}(\tan x)^{-1/2}$ (D) $2(\tan x)^{-1/2}$ **[B]**

Q.3 $\frac{d}{dx}\sin(\log x)$

(A) $\cos(\log x)$ (B) $\log(\cos x)$

(C) $x\cos(\log x)$ (D) $\frac{\cos(\log x)}{x}$ **[D]**

Q.4 $\frac{d}{dx}\sqrt{2x^2+1}$

(A) $2x\,(2x^2+1)^{1/2}$ (B) $2x\,(2x^2+1)^{-1/2}$

(C) $(2x^2+1)^{1/2}$ (D) $(2x^2+1)^{-1/2}$ **[B]**

Q.5 $\frac{d}{dx}e^{\sqrt{2x}}$

(A) $\frac{e^{\sqrt{2x}}}{\sqrt{2x}}$ (B) $\sqrt{2x}\,e^{\sqrt{2x}}$

(C) $e^{\sqrt{2x}}$ (D) $e^{(2x)^{-1/2}}$ **[A]**

Q.6 $\frac{d}{dx}(x^4 - 2\sin x + 3\cos x)$

(A) $4x^3 - 2\cos x + 3\sin x$

(B) $3x^2 + 2\cos x + 3\sin x$

(C) $4x^3 + 2\cos x - 3\sin x$

(D) $4x^3 - 2\cos x - 3\sin x$ **[D]**

Q.7 $\frac{d}{dx}(x^2\sin x\log x)$

(A) $2x\sin x\log x + x^2\cos x\log x + x\sin x$

(B) $x^2\sin x\log x + 2x\cos x\log x + x\sin x$

(C) $2x\sin x\log x + x^2\cos x\log x + \sin x$

(D) None of these **[A]**

Q.8 $\frac{d}{dx}\frac{(x^2+1)}{x+1}$

(A) $\frac{x^2+2x-1}{(x+1)^2}$ (B) $\frac{x^2-2x+1}{(x+1)^2}$

(C) $\frac{x^2+2x-1}{x+1}$ (D) $\frac{x^2+2x+1}{(x+1)^2}$ **[A]**

Q.9 $xy = c^2$, then $\frac{dy}{dx}$

(A) $\frac{x}{y}$ (B) $\frac{y}{x}$ (C) $-\frac{x}{y}$ (D) $-\frac{y}{x}$ **[D]**

Q.10 $x = at^2$; $y = 2at$, then $\frac{dy}{dx}$

(A) t (B) $\frac{1}{t}$ (C) 1 (D) none **[B]**

Q.11 $\int(1-x)\sqrt{x}\,dx$

(A) $\frac{2}{3}x^{3/2} + \frac{2}{5}x^{5/2} + C$

(B) $-\frac{2}{3}x^{3/2} + \frac{2}{5}x^{5/2} + C$

(C) $-\frac{2}{3}x^{3/2} - \frac{2}{5}x^{5/2} + C$

(D) $+\frac{2}{3}x^{3/2} - \frac{2}{5}x^{5/2} + C$ **[D]**

Q.12 $\int\frac{\mathrm{cosec}^2 x\,dx}{1+\cot x}$

(A) $-\log|1+\cot x| + C$

(B) $\log|1+\cot x| + C$

(C) $\log|1+\tan x| + C$

(D) $-\log|1+\tan x| + C$ **[A]**

Q.13 $\int \frac{\log x}{x} . dx$

(A) $\log x + C$ (B) $\frac{(\log x)^2}{2} + C$

(C) $-\frac{(\log x)^2}{2} + C$ (D) $-\log x + C$ **[B]**

Q.14 $\int_0^1 xe^x \, dx$

(A) 0 (B) 1 (C) e (D) e^{-1} **[B]**

Q.15 $\int_0^{\pi/2} (\sin x + \cos x) dx$

(A) 2 (B) 1 (C) 3 (D) 4 **[A]**

Q.16 $\int_0^{\infty} e^{-x} dx$

(A) 1 (B) 0

(C) ∞ (D) none of these **[A]**

Q.17 $\int_{-\pi/4}^{\pi/4} \frac{1}{1+\sin x} \, dx$

(A) 1 (B) –1 (C) –2 (D) 2 **[D]**

Q.18 $I = \int \frac{(x+a)^3}{x^3} dx$ is equal to -

(A) $x + 3a \log x - \frac{3a^2}{x} - \frac{a^3}{2x^2} + C$

(B) $x^2 + 2a \log x - \frac{3a^2}{x} - \frac{a^3}{2x^2} + C$

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

(D) $1 + 2a \log x + \frac{2a^2}{x} - \frac{3a^2}{2x^2} + C$ **[A]**

Q.19 $I = \int \frac{1-x^4}{1-x} dx$; then I is equal to -

(A) $x + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + C$

(B) $\frac{x}{2} + \frac{x^2}{3} + \frac{x^3}{4} + \frac{x^4}{5} + C$

(C) $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + C$

(D) $\frac{x}{2} - \frac{x^2}{3} + \frac{x^3}{4} - \frac{x^4}{5} + C$ **[A]**

Q.20 If $I = \int \frac{(1+x)^3}{\sqrt{x}} dx$; then I =

(A) $2\sqrt{x} + 2x^{3/2} - \frac{6}{5} x^{5/2} - \frac{2}{7} x^{7/2} + C$

(B) $2\sqrt{x} + 2x^{3/2} + \frac{6}{5} x^{5/2} + \frac{2}{7} x^{7/2} + C$

(C) $3\sqrt{x} + 3x^{3/2} - \frac{6}{5} x^{6/5} - \frac{2}{7} x^{-7/2} + C$

(D) $3\sqrt{x} - 3x^{3/2} + \frac{6}{5} x^{6/5} - \frac{2}{7} x^{-7/2} + C$ **[B]**

Q.21 $I = \int \frac{1+2\sin x}{\cos^2 x} dx$; then I is equal to–

(A) tan x + sec x + C (B) tan x – sec x + C

(C) tan x – 2 sec x + C (D) tan x + 2 sec x + C

[D]

Q.22 $\frac{d}{dx}\left(\frac{\sin x - x\cos x}{x\sin x + \cos x}\right)$

(A) $\frac{1}{(x\sin x + \cos x)^2}$ (B) $\frac{\sin x}{(x\sin x + \cos x)^2}$

(C) $\frac{\cos x}{(x\sin x + \cos x)^2}$ (D) $\frac{x^2}{(x\sin x + \cos x)^2}$

[D]

Q.23 $x^y = y^x$; then $\frac{dy}{dx}$

(A) $\frac{y}{x}\left(\frac{x\log y - y}{y\log x - x}\right)$ (B) $\frac{x}{y}\left(\frac{x\log y - y}{y\log x - x}\right)$

(C) $\frac{y}{x}\left(\frac{y\log x - x}{x\log y - y}\right)$ (D) $\frac{x}{y}\left(\frac{y\log x - x}{x\log y - y}\right)$

[A]

Q.24 $\int \frac{1}{\sin^2 x \cos^2 x} \, dx$

(A) cot x + tan x + C (B) tan x – cot x + C

(C) – tan x + cot x + C (D) – tan x – cot x + C

[B]

Q.25 $\int \frac{1}{1+e^{-x}} dx$

(A) $\log|1 + e^x| + C$ (B) $-\log|1 + e^x| + C$

(C) $\log|1 + e^{-x}| + C$ (D) $-\log|1 + e^x| + C$

[A]

Q.26 I = $\int \frac{x+2}{(x+1)^2}$ dx; then I is equal to –

(A) log (x + 1) + $\frac{1}{x+1}$ + C

(B) log (x + 2) – $\frac{1}{x+1}$ + C

(C) log (1 + x) – $\frac{1}{x+1}$ + C

(D) log (x + 2) + $\frac{1}{x+1}$ + C **[C]**

Q.27 If I = $\int \frac{5\cos^3 x + 2\sin^3 x}{2\sin^2 x \cos^2 x}$ dx ; then I =

(A) $\frac{5}{2}$ cosec x + 3sec x + C

(B) 5cosec x + 3sec x + C

(C) $-\frac{5}{2}$ cosec x – sec x + C

(D) $-\frac{5}{2}$ cosec x + sec x + C **[D]**

Q.28 y = $\int \sqrt{1+\sin 2x}$ dx ; y is equal to –

(A) sin x – cos x + C

(B) sin x + cos x + C

(C) 2 sin x – cos x + C

(D) 2cos x – sin x + C **[A]**

Q.29 I = $\int \frac{1-\cos 2x}{1+\cos 2x}$ dx ; then I is equal to –

(A) tan x – x + C (B) tan x + x + C

(C) tan x sec x – x + C (D) tan x sec x + x + C

[A]

Q.30 $\frac{d}{dx}\left(1+\frac{1}{x^2}+\frac{1}{x^3}\right)$

(A) x + $\frac{1}{x^2}$ + $\frac{1}{x^3}$ (B) $\frac{-2}{x^3} - \frac{3}{x^4}$

(C) x – $\frac{1}{x^2} - \frac{3}{x^3}$ (D) $\frac{-2}{x} - \frac{3}{x^2}$ **[B]**

Q.31 $\int \tan^2 x\, dx$

(A) $\sec^2 x$ + x + C (B) sec x tan x + C

(C) tan x – x + C (D) 2 tan x $\sec^2$ x + C

[C]

Q.32 $\int e^{-x} dx$

(A) $-e^{-x}$ + C (B) e^{-x} + C

(C) – e^{x} + C (D) e^{-x} + x + C **[A]**

Q.33 $\int \frac{1}{\sin^2 x \cos^2 x}$ dx

(A) tan x + cot x + C (B) tan x – cot x + C

(C) cot x – tan x + C (D) – tan x – cot x + C

[B]

Q.34 $\frac{d}{dx}(\sin \sin \sin x)$

(A) sin sin sin x cos sin x cos x

(B) cos sin sin x. sin cos x sin x

(C) sin cos sin x .cos sin x . cos x

(D) cos sin sin x . cos sin x . cos x **[D]**

Q.35 $\frac{d}{dx} e^{e^{e^{-x}}}$

(A) $-e^{e^{e^{-x}}} \; e^{e^{x}} \; e^{x}$ (B) $-e^{e^{e^{-x}}} . e^{e^{-x}} . e^{-x}$

(C) $-e^{e^{e^{-x}}} \; e^{e^{x}} \; e^{-x}$ (D) $-e^{e^{e^{-x}}} \; e^{e^{-x}} \; e^{x}$

[B]

Q.36 $\frac{d}{dx}\left(\sqrt{\sin\sqrt{x}}\right)$

(A) $\frac{1}{4} \frac{\cos\sqrt{x}}{\sqrt{x \sin\sqrt{x}}}$ (B) $\frac{1}{2} \frac{\cos\sqrt{x}}{\sqrt{\sin\sqrt{x}}}$

(C) $\frac{1}{4} \frac{\cos\sqrt{x}}{\sqrt{\sin\sqrt{x}}}$ (D) $\frac{1}{2} \frac{\cos\sqrt{x}}{\sqrt{x \sin\sqrt{x}}}$ **[A]**

Q.37 $\frac{d}{dx} \sin^2 (x^2)$

(A) 2x $\sin^2 x^2 \cos x^2$ (B) 4x sin x^2 cos x

(C) 2x sin $2x^2$ (D) 4x sin x cos x^2

[C]

Q.38 $\int \sqrt{1 + \sin 2x}\, dx$

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

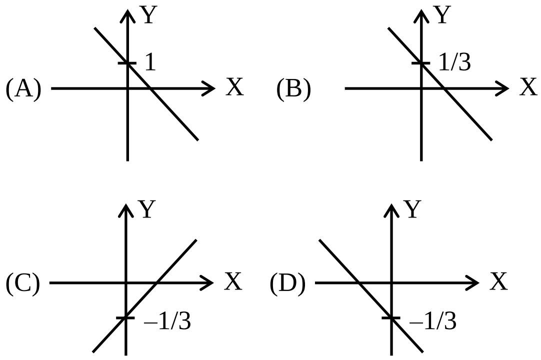
[C]

Q.39 $\int \frac{(\log x)^2}{x}\, dx$

(A) $\frac{(\log x)^3}{3} + C$ (B) $\log x + C$

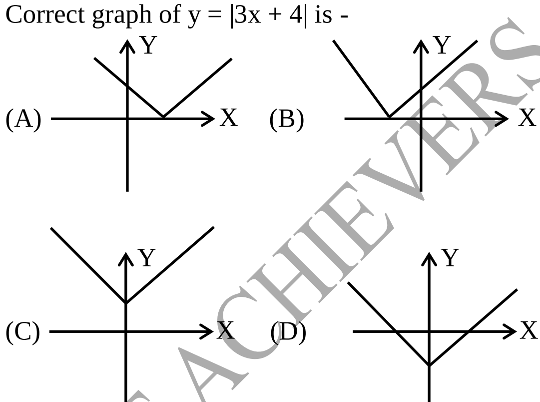
(C) $\frac{(\log x)^2}{2} + C$ (D) $2 \log x + C$ **[A]**

Q.40 Correct graph of $3x + 4y + 1 = 0$ is -



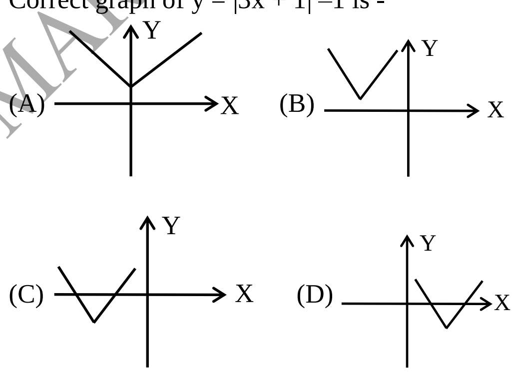
[D]

Q.41 Correct graph of $y = |3x + 4|$ is -



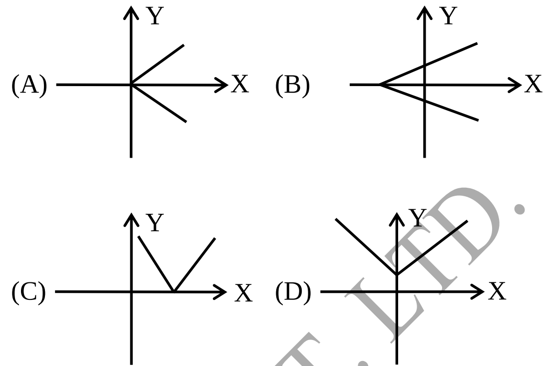
[B]

Q.42 Correct graph of $y = |3x + 1| - 1$ is -



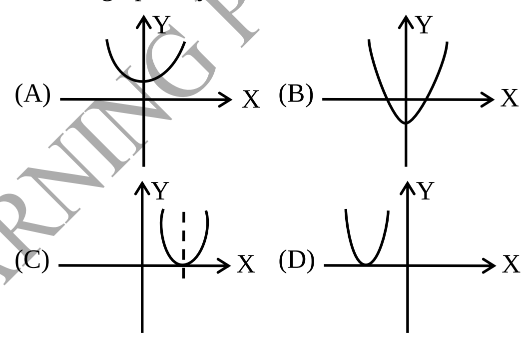
[C]

Q.43 Correct graph of $|y| = x + 1$ is -



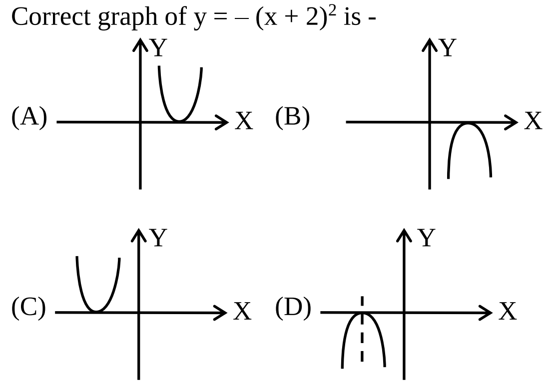
[B]

Q.44 Correct graph of $y - 1 = x^2$ is -



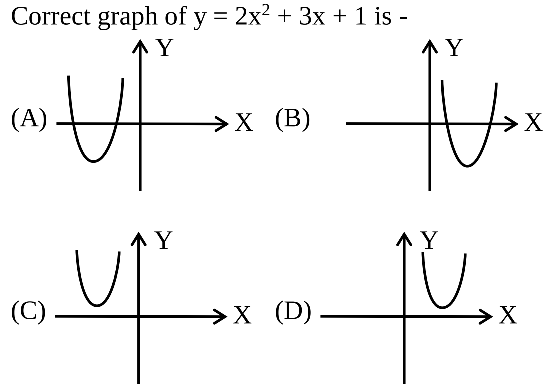
[A]

Q.45 Correct graph of $y = -(x + 2)^2$ is -



[D]

Q.46 Correct graph of $y = 2x^2 + 3x + 1$ is -



[A]

Q.47 $y = \sec x + \tan x$, value of $\frac{dy}{dx}$ is -

(A) $\sec^2 x + \tan x$ (B) $\tan^2 x + \sec x$

(C) $\sec x (\tan x + \sec x)$ (D) $\sec x (1 + \sec x)$

[C]

Q.48 $y = \cos^2 x$ is given, then $\frac{dy}{dx}$ is -

(A) $-2 \sin x \cos x$ (B) $2 \sin x \cos x$

(C) $\sin^2 x$ (D) none of these **[A]**

Q.49 If $y = \tan[\log(x^2)]$, then $\frac{dy}{dx}$ is -

(A) $2x \sec^2[\log(x^2)]$ (B) $\frac{2\sec^2[\log(x^2)]}{x}$

(C) $x \sec^2[\log(x^2)]$ (D) $\frac{1}{x^2} \sec^2 [\log(x^2)]$

[B]

Q.50 If $y = x^3 \tan(\log x)$, then $\frac{dy}{dx}$ is -

(A) $3x^2 \tan (\log x) + x^3 \sec^2(\log x)$

(B) $3x^2 \tan (\log x) + x^2 \sec^2(\log x)$

(C) $x^2[\tan(\log x) + \sec^2(\log x)]$

(D) $3x \sec^2 (\log x)$ **[B]**

PHYSICS

Q.1 If $y = 4x^2 - 4x + 7$. Find the minimum value of y.

Sol. **[6]**

$y = 4x^2 - 4x + 7$

$\frac{dy}{dx} = 0$, $x = \frac{1}{2}$

$\frac{d^2y}{dx^2} = 8 > 0$

$y_{min}\, 4 \times \left(\frac{1}{2}\right)^2 - 4 \times \frac{1}{2} + 7$

$= 1 - 2 + 7 = 6$

Q.2 If $y = x^3 - 3x$. Find the maximum value of y.

Sol. **[2]**

$y = x^3 - 3x$

$\frac{dy}{dx} = 3x^2 - 3 = 0 \quad x = \pm 1$

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

when x = +1

$\frac{d^2y}{dx^2} = 6 > 0$

Q.3 If $y = x^3 - 3x$. Find the value of x at which we get minimum value of y.

Sol. **[1]**

Q.4 Position of a particle moving along a straight line is given by $x = 2t^2 + t$. Find the velocity at t = 2 sec.

Sol. **[9]**

$x = 2t^2 + t$

$\frac{dx}{dt} = 4t + 1$

$v = 4t + 1 = 9$ m/s

Q.5 If velocity of a particle is given by $v = 2t - 1$ then find the acceleration of particle at t = 2s.

Sol. **[2]**

$v = 2t - 1$

$\frac{dv}{dt} = 2$ m/s^2

Q.6 Find $\frac{\int_0^{\pi/2} \sin x\, dx}{\int_0^{\infty} e^{-x}} = 1$

Sol. **[1]**

$\frac{\int_0^{\pi/2} \sin x}{\int_0^{\infty} e^{-x}} = \frac{1}{1} = 1$

Q.7 Position of a particle moving along a straight line is given by $x = 2t^2 + t$. Find the velocity at t = 2 sec.

Sol.[9] $x = 2t^2 + t$

$\frac{dx}{dt} = 4t + 1$

$v = 4t + 1 = 9$ m/s

Q.8 If velocity of a particle is given by $v = 2t - 1$ then find the acceleration of particle at t = 2s.

Sol.[2] $v = 2t - 1$

$\frac{dv}{dt} = 2$ m/s^2