MATHEMATICAL TOOLS

PART - I : FUNCTION & DIFFERENTIATION

* Marked Questions may have more than one correct option.
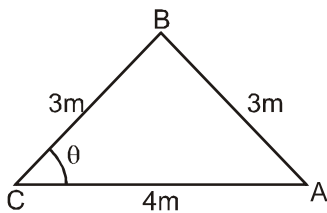
SECTION - (A) : FUNCTION

1. Surface area of sphere as a function of its radius is $A(r) = 4\pi r^2$ the value of A(10) will be :
(1) 1358 m^2
(2) 324 m^2
(3) 314 m^2
(4) 1256 m^2

2. If f (x) = x^2 −1
Find f [f (2)]
(1) 5
(2) 6
(3) 7
(4) 8

3. If $f(x) = x + \dfrac{1}{x}$, then the value of f (1) will be
(1) 2
(2) −2
(3) 1
(4) −1

4. Find v (0), where v (t) = 3 + 2t
(1) 5
(2) 6
(3) 3
(4) None

5. If f (θ) = sin θ, find f (π/6)
(1) $\dfrac{\pi}{6}$
(2) $\dfrac{1}{2}$
(3) 2
(4) $\dfrac{\pi}{3}$

6. If f (x) = 5, then the value of f (10) will be
(1) 10
(2) 5
(3) 15
(4) None

SECTION - (B) : TRIGONOMETRY

1. tan15° is equilvalent to :
(1) $(2 - \sqrt{3})$
(2) $(5 + \sqrt{3})$
(3) $\left(\dfrac{5 - \sqrt{3}}{2}\right)$
(4) $\left(\dfrac{5 + \sqrt{3}}{2}\right)$

2. sin^{2}θ is equivalent to :
(1) $\left(\dfrac{1 + \cos\theta}{2}\right)$
(2) $\left(\dfrac{1 + \cos 2\theta}{2}\right)$
(3) $\left(\dfrac{1 - \cos 2\theta}{2}\right)$
(4) $\left(\dfrac{\cos 2\theta - 1}{2}\right)$

3. sinA . sin(A + B) is equal to
(1) cos^{2}A . cosB + sinA sin^{2}B
(2) sin^{2}A . cosB + $\dfrac{1}{2}$ cos2A . sinB
(3) sin^{2}A . cosB + $\dfrac{1}{2}$ sin2A . sinB
(4) sin^{2}A . sinB + cosA cos^{2}B

4*. −sinθ is equivelent to :
(1) $\cos\left(\dfrac{\pi}{2} + \theta\right)$
(2) $\cos\left(\dfrac{\pi}{2} - \theta\right)$
(3) sin (θ − π)
(4) sin (π + θ)

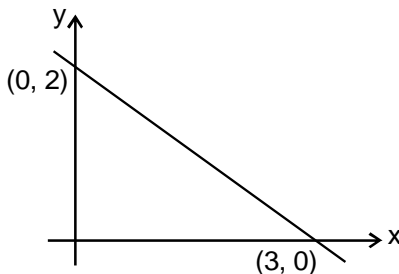**5*.** θ is angle between side CA and CB of triangle, shown in the figure then θ is given by :

(1) $\cos\theta = \dfrac{2}{3}$ (2) $\sin\theta = \dfrac{\sqrt{5}}{3}$ (3) $\tan\theta = \dfrac{\sqrt{5}}{2}$ (4) $\tan\theta = \dfrac{2}{3}$

6. If $\tan\theta = \dfrac{1}{\sqrt{5}}$ and θ lies in the first quadrant, the value of cos θ is :

(1) $\sqrt{\dfrac{5}{6}}$ (2) $-\sqrt{\dfrac{5}{6}}$ (3) $\dfrac{1}{\sqrt{6}}$ (4) $-\dfrac{1}{\sqrt{6}}$

SECTION - (C) : COORDINATE GEOMETRY AND ALGEBRA

1. Calculate slope of shown line

(1) 2/3 (2) -2/3 (3) 3/2 (4) -3/2

2. Roots of the equation $2x^2 + 5x - 12 = 0$, are
(1) 3/2, 4 (2) 2/3, -4 (3) 3/2, -4 (4) 2/3, 4

3. The speed (v) of a particle moving along a straight line is given by $v = t^2 + 3t - 4$ where v is in m/s and t in seconds. Find time t at which the particle will momentarily come to rest.
(1) 3 (2) 4 (3) 2 (4) 1

SECTION - (D) : DIFFERENTIATION

Find derivative of given functions w.r.t. the independent variable.

1. $y = x^2 + x + 8$

(1) $\dfrac{dy}{dx} = 2x + 1$ (2) $\dfrac{dy}{dx} = 2 + 1$ (3) $\dfrac{dx}{dy} = 2x - 1$ (4) $\dfrac{dy}{dx} = x + 1$

2. $y = \tan x + \cot x$
(1) $\tan^2 x + \mathrm{cosec}^2 x$ (2) $\cot^2 x - \sin^2 x$ (3) $\sec^2 x - \mathrm{cosec}^2 x$ (4) $\sec x + \mathrm{cosec}\, x$

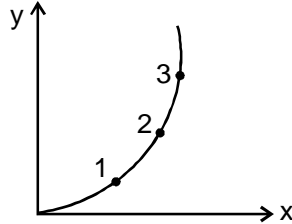**3.** If $y = \ell nx + e^x$, then $\dfrac{d^2 y}{dx^2}$ is equal to

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

4. $y = e^x \ell nx$

(1) $e^x \ell nx + \dfrac{e^x}{x}$

(2) $e^x \ell nx - \dfrac{e^x}{x}$

(3) $e^x \ell nx - \dfrac{e}{x}$

(4) None of these

5. $y = \sin 5x$
(1) $5 \sin 2x$ (2) $3 \cos 3x$ (3) $5 \cos 5x$ (4) $2 \cos 2x$

6. $(x + y)^2 = 4$

(1) $\dfrac{dy}{dx} = +1$

(2) $\dfrac{dy}{dx} = -1$

(3) $\dfrac{d}{dx} = -1$

(4) $\dfrac{dy}{d} = -1$

7. $y = 2u^3$, $u = 8x - 1$

(1) $\dfrac{dy}{dx} = 48(8x - 1)^2$

(2) $\dfrac{dy}{dx} = 58(5x - 1)^2$

(3) $\dfrac{dy}{dx} = 35(8x + 1)^2$

(4) $\dfrac{dy}{dx} = 28(8x - 1)$

8. Given $s = t^2 + 5t + 3$, find $\dfrac{ds}{dt}$. at $t = 1$

(1) 7   (2) 9   (3) 12   (4) 15

9. If $s = ut + \dfrac{1}{2}at^2$, where u and a are constants. Obtain the value of $\dfrac{ds}{dt}$.

(1) $u - at$ (2) $u + at$ (3) $2u + at$ (4) None of these

10. The minimum value of $y = 5x^2 - 2x + 1$ is

(1) $\dfrac{1}{5}$ (2) $\dfrac{2}{5}$ (3) $\dfrac{4}{5}$ (4) $\dfrac{3}{5}$

11. $y = \dfrac{2x + 5}{3x - 2}$

(1) $y' = \dfrac{-19}{(3x + 2)^2}$

(2) $y' = \dfrac{19}{(3x - 2)^2}$

(3) $y' = \dfrac{-19}{(3x + 2)}$

(4) $y' = \dfrac{-19}{(3x - 2)^2}$

12. A uniform metallic solid sphere is heated uniformly. Due to thermal expansion, its radius increases at the rate of 0.05 mm/second. Find its rate of change of volume with respect to time when its radius becomes 10 mm. (take $\pi = 3.14$)
(1) 31.4 mm³/ second   (2) 62.8 mm³/ second   (3) 3.14 mm³/ second   (4) 6.28 mm³/ second

13. If $y = 3t^2 - 4t$; then minima of y will be at :
(1) 3/2   (2) 3/4   (3) 2/3   (4) 4/3

14. If $y = \sin(t^2)$, then $\dfrac{d^2y}{dt^2}$ will be -

(1) $2t \cos(t^2)$
(3) $4t^2 \sin(t^2)$

(2) $2 \cos(t^2) - 4t^2 \sin(t^2)$
(4) $2 \cos(t^2)$

15. The displacement of a body at any time t after starting is given by $s = 15t - 0.4t^2$. The velocity of the body will be 7 ms⁻¹ after time :
(1) 20 s   (2) 15 s   (3) 10 s   (4) 5 s

16. For the previous question, the acceleration of the particle at any time t is :
(1) -0.8 m/s²   (2) 0.8 m/s²   (3) -0.6 m/s²   (4) 0.5 m/s²

17. If velocity of particle is given by $v = 2t^4$ then its acceleration (dv/dt) at any time t will be given by :
(1) $8t^3$ (2) $8t$ (3) $-8t^3$ (4) t^2

18. The maximum value of xy subject to $x + y = 8$, is :
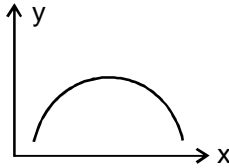(1) 8   (2) 16   (3) 20   (4) 24

19. If $y = 3t^2 - 4t$; then minima of y will be at :
(1) 3/2   (2) 3/4   (3) 2/3   (4) 4/3

20. The slope of graph as shown in figure at points 1, 2 and 3 is m_1, m_2 and m_3 respectively them

(1) $m_1 > m_2 > m_3$ (2) $m_1 < m_2 < m_3$ (3) $m_1 = m_2 = m_3$ (4) $m_1 = m_2 > m_3$

21. Magnitude of slope of the shown graph.

(1) First increases then decreases   (2) First decrease then increases
(3) Increases   (4) Decreases

22. $y = -x^2 + 3$

(1) $\dfrac{dy}{dx} = -2x$, $\dfrac{d^2y}{dx^2} = -2$ (2) $\dfrac{dy}{dx} = 2x$, $\dfrac{d^2y}{dx^2} = -2$

(3) $\dfrac{dy}{dx} = -2x$, $\dfrac{d^2y}{dx^2} = 2$ (4) none of these

23. $y = \dfrac{x^3}{3} + \dfrac{x^2}{2} + \dfrac{x}{4}$

(1) $\dfrac{dy}{dx} = x^2 - x + \dfrac{1}{4}$, $\dfrac{d^2y}{dx^2} = 2x + 3$ (2) $\dfrac{dy}{dx} = x^2 + x - \dfrac{1}{4}$, $\dfrac{d^2y}{dx^2} = 2x + 1$

(3) $\dfrac{dy}{dx} = x^2 + x + \dfrac{1}{4}$, $\dfrac{d^2y}{dx^2} = 2x + 1$ (4) $\dfrac{dy}{dx} = -x^2 + x + \dfrac{1}{4}$, $\dfrac{d^2y}{dx^2} = 2x - 1$

24. $y = 4 - 2x - x^{-3}$

(1) $\dfrac{dy}{dx} = 2 + 3x^{-4}$, $\dfrac{d^2y}{dx^2} = -12x^{-5}$ (2) $\dfrac{dy}{dx} = -2 + 3x^{-4}$, $\dfrac{d^2y}{dx^2} = -12x^{-5}$

(3) $\dfrac{dy}{dx} = -2 + 3x^{-4}$, $\dfrac{d^2y}{dx^2} = 12x^{-5}$ (4) $\dfrac{dy}{dx} = -2 - 3x^{-4}$, $\dfrac{d^2y}{dx^2} = -12x^{-5}$

25. $y = -10x + 3\cos x$
(1) $10 - 3\sin x$ (2) $-10 + 3\sin x$ (3) $-10 + 5\sin x$ (4) $-10 - 3\sin x$

26. $y = \dfrac{3}{x} + 5 \sin x$

(1) $-\dfrac{3}{x^2} + 5 \cos x$ (2) $\dfrac{3}{x^2} + 5 \cos x$ (3) $-\dfrac{3}{x^2} - 5 \cos x$ (4) $-\dfrac{3}{x^2} - 5 \cos x$

27. $y = \csc x - 4\sqrt{x} + 7$

(1) $-\csc x \cot x - \dfrac{2}{\sqrt{x}}$ (2) $\csc x \cot x - \dfrac{2}{\sqrt{x}}$ (3) $-\csc x \cot x + \dfrac{2}{\sqrt{x}}$ (4) $\csc x \cot x + \dfrac{2}{\sqrt{x}}$

Find $\dfrac{ds}{dt}$.

28. $s = \tan t - t$
(1) $\sec^2 t + 1$ (2) $\sec^2 t$ (3) $\sec t - 1$ (4) $\sec^2 t - 1$

29. $s = t^2 - \sec t + t$
(1) $2t + \sec t \tan t + 1$ (2) $2t - \sec t \tan t + 1$ (3) $2t - \sec t \tan t - 1$ (4) $2t + \sec t \tan t - 1$

30. $p = 5 + \dfrac{1}{\cot q}$
(1) $\sec^2 q$ (2) $\sec^3 q$ (3) $\sec q$ (4) $\tan^2 q$

31. $p = (1 + \csc q) \cos q$
(1) $\sin q - \csc^2 q$ (2) $-\sin q + \csc^2 q$ (3) $-\sin q - \cos^2 q$ (4) $\sec q - \csc^2 q$

32. $y = \sin^3 x$
(1) $3 \sin^2 x (\cos x)$ (2) $3 \sin^3 x (\cos x)$ (3) $3 \sin x (\cos x)^2$ (4) $\sin x (\cos x)$

33. $y = 5 \cos^{-4} x$.
(1) $20 \sin x \cos^{-5} x$ (2) $10 \sin x \cos^{-5} x$ (3) $20 \sin x \cos^{-3} x$ (4) $20 \sin x \sin^{-5} x$

Find the derivatives of the functions

34. $s = \dfrac{4}{3\pi} \sin 3t + \dfrac{4}{5\pi} \cos 5t$

(1) $\dfrac{4}{\pi} (\cos 3t - \sin 5t)$ (2) $\dfrac{4}{\pi} (\cos 3t + \sin 5t)$

(3) $\dfrac{4}{\pi} (\cos t - \sin t)$ (4) $\dfrac{4}{\pi} (\cot 3t - \sec 5t)$

35. $s = \sin\left(\dfrac{3\pi t}{2}\right) + \cos\left(\dfrac{3\pi t}{2}\right)$

(1) $\dfrac{3\pi}{2}\left[\cos\left(\dfrac{3\pi t}{2}\right) - \sin\left(\dfrac{3\pi t}{2}\right)\right]$ (2) $\dfrac{3\pi}{2}\left[\cos\left(\dfrac{3\pi t}{2}\right) + \sin\left(\dfrac{3\pi t}{2}\right)\right]$

(3) $\dfrac{3\pi}{2}\left[\cot\left(\dfrac{3\pi t}{2}\right) + \sin\left(\dfrac{3\pi t}{2}\right)\right]$ (4) None of these

SECTION - (E) : INTEGRATION

Find intergration of following w.r.t. independent variable

1. $\displaystyle\int (x^2 - 2x + 1)dx$

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

2. $\int\left(\sqrt{x}+\dfrac{1}{\sqrt{x}}\right)dx$

(1) $\dfrac{2\sqrt{x}}{3}+2\sqrt{x}-c$ 　(2) $\dfrac{2\sqrt{x^2}}{3}-2\sqrt{x}+c$ 　(3) $\dfrac{2\sqrt{x^3}}{3}+2\sqrt{x}+c$ 　(4) $\dfrac{2\sqrt{x}}{2}+2\sqrt{x}-c$

3. $\int\dfrac{1}{3x}dx$

(1) $\dfrac{1}{3}\ell nx+x$ 　　(2) $\dfrac{1}{3}\ell nx$ 　　(3) $\dfrac{1}{2}\ell nx+c$ 　　(4) $\dfrac{1}{3}\ell nx+c$

4. $\int x\sin(2x^2)dx,\ \ (\text{use},\ u=2x^2\ )$

(1) $-\dfrac{1}{4}\cos(2x^2)+C$ 　(2) $\dfrac{1}{4}\cos(2x^2)-C$ 　(3) $-\dfrac{1}{2}\cos(2x)+C$ 　(4) $-\dfrac{1}{3}\cos(3x^2)+C$

5. $\int\dfrac{3}{(2-x)^2}dx$

(1) $\dfrac{2}{3-x}+C$ 　　(2) $\dfrac{2}{2-x}+C$ 　　(3) $\dfrac{3}{2-x}+C$ 　　(4) $\dfrac{3}{2+x}+C$

6. $\displaystyle\int_{-4}^{-1}\dfrac{\pi}{2}\,d\theta$

(1) $\dfrac{3\pi}{3}$ 　　　(2) $\dfrac{3\pi}{2}$ 　　　(3) $\dfrac{2\pi}{3}$ 　　　(4) $\dfrac{\pi}{2}$

7. $\displaystyle\int_{0}^{1}e^x\,dx$

(1) $e-1$ 　　　(2) $e+1$ 　　　(3) $e-2$ 　　　(4) None of these

8. $y=2x$, the area under the curve from $x=0$ to $x=b$ will be :

(1) $b^2/2$ units 　　(2) b^2 units 　　(3) $2b^2$ units 　　(4) $b/2$ units

9. $y=\displaystyle\int_{0}^{\pi}\sin x\,dx$

(1) 2 units 　　(2) 3 units 　　(3) 4 units 　　(4) 5 units

10. Evaluate the following integrals :

(i) $\int x^{15}dx$ 　　　　　(ii) $\int x^{-3/2}dx$

(iii) $\int(3x^{-7}+x^{-1})dx$ 　　　(iv) $\int\left(\sqrt{x}+\dfrac{1}{\sqrt{x}}\right)^2 dx$

(v) $\int\left(x+\dfrac{1}{x}\right)dx$ 　　　(vi) $\int\left(\dfrac{a}{x^2}+\dfrac{b}{x}\right)dx$ 　　(a and b are constant)

11. The integral $\displaystyle\int_{1}^{5}x^2dx$ is equal to

(1) $\dfrac{125}{3}$ 　　　(2) $\dfrac{124}{3}$ 　　　(3) $\dfrac{1}{3}$ 　　　(4) 45

12. Evaluate the following integrals (Here G,M,m,k,q_1,q_2, m are constant)

(i) $\int_R^\infty \frac{GMm}{x^2}dx$

(ii) $\int_{r_1}^{r_2} -k\frac{q_1q_2}{x^2}dx$

(iii) $\int_u^v Mv\,dv$

(iv) $\int_0^\infty x^{-1/2}dx$

(v) $\int_0^{\pi/2} \sin x\,dx$

(vi) $\int_0^{\pi/2} \cos x\,dx$

(vii) $\int_{-\pi/2}^{\pi/2} \cos x\,dx$

13. $\int x^{-\frac{3}{2}}dx$ is equal to :

(1) $\frac{-2}{\sqrt{x}}+C$

(2) $\frac{2}{\sqrt{x}}+C$

(3) $2\sqrt{x}+C$

(4) $-2\sqrt{x}+C$

14. $\int x^{-\frac{5}{3}}dx$ is equal to :

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

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

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

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

15. $\int x^{2012}dx$ is equal to :

(1) $\frac{X^{2013}}{2013}+C$

(2) $\frac{X^{2011}}{2011}+C$

(3) $2012\,X^{2011}+C$

(4) $-2012\,X^{2011}+C$

16. $\int 2\sin(x)dx$ is equal to :

(1) $-2\cos x + C$

(2) $2\cos x + C$

(3) $-2\cos x$

(4) $2\cos x$

17. $\int (\sin x + \cos x)dx$ is equal to :

(1) $-\cos x + \sin x$

(2) $-\cos x + \sin x + C$

(3) $\cos x - \sin x + C$

(4) $-\cos x - \sin x + C$

18. $\int (x + x^2 + x^3 + x^4)dx$ is equal to :

(1) $1+2x+3x^2+4x^3 + C$

(2) $1+2x+3x^2+4x^3$

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

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

19. If $y = \sin(ax+b)$, then $\int y\,dx$ will be :

(1) $\frac{\cos(ax+b)}{a} + C$

(2) $-\frac{\cos(ax+b)}{a} + C$

(3) $a\cos(ax+b)+C$

(4) $-a\cos(ax+b)+C$

20. If $y = x^2\sin(x^3)$, then $\int y\,dx$ will be :

(1) $-\cos(x^3) + C$

(2) $\left(-\frac{\cos x^3}{3}\right)+C$

(3) $\cos(x^3) + C$

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

21. If $y = x^2$, then area of curve y v/s x from x = 0 to 2 will be :

(1) 1/3

(2) 8/3

(3) 4/3

(4) 2/3

22. If $y = t \sin (t^2)$ then $\int y\,dt$ will be :

(1) $\dfrac{\cos(t^2)}{2} + c$

(2) $\dfrac{\cos(t^2)}{2} + c$

(3) $\dfrac{-\cos(t^2)}{2} + c$

(4) $\cos (t^2)$

23. If $x = (6y + 4)(3y^2 + 4y + 3)$ then $\int x\,dy$ will be :

(1) $\dfrac{1}{3y^2 + 4y + 3}$

(2) $\dfrac{(3y^2 + 4y + 3)^2}{2} + C$

(3) $(3y^2 + 4y + 3)$

(4) $\dfrac{(6y + 4)}{(3y^2 + 4y + 3)}$

24. Value of $\displaystyle\int_0^{\pi/2} \cos 3t\,dt$ is

(1) $\dfrac{2}{3}$

(2) $-\dfrac{1}{3}$

(3) $-\dfrac{2}{3}$

(4) $\dfrac{1}{3}$

25. $\displaystyle\int_0^1 (t^2 + 9t + c)\,dt = \dfrac{9}{2}$. Then the value of 'c'.

(1) $\dfrac{2}{3}$

(2) $-\dfrac{1}{3}$

(3) $-\dfrac{2}{3}$

(4) $\dfrac{1}{3}$

26. Find the value of following integration.

$\displaystyle\int_0^{2\pi} \sin^2 \theta\,d\theta$

Here c,a are constants.

(1) π

(2) 2π

(3) 3π

(4) 4π

27. If $y = \dfrac{1}{ax + b}$, then $\int y\,dx$ will be :

(1) $\dfrac{1}{(ax + b)^2} + C$

(2) $ax + b + C$

(3) $a\ell n(ax+b)+C$

(4) $\dfrac{\ell n(ax + b)}{a} + C$

28. $\displaystyle\int_{\pi}^{2\pi} \theta\,d\theta$

(1) $\dfrac{3\pi^2}{2}$

(2) $\dfrac{3\pi^3}{2}$

(3) $\dfrac{\pi^3}{2}$

(4) π

29. $\displaystyle\int_0^{\sqrt[3]{7}} x^2\,dx$

(1) $\dfrac{7}{3}$

(2) $\dfrac{7}{4}$

(3) $\dfrac{5}{4}$

(4) 0

30. $\displaystyle\int_0^1 \dfrac{dx}{3x + 2}$

(1) $\ell n\left(\dfrac{5}{2}\right)^{\frac{1}{3}}$

(2) $\ell n\left(\dfrac{5}{2}\right)^{\frac{1}{2}}$

(3) $\ell n\left(\dfrac{5}{2}\right)^{\frac{1}{4}}$

(4) None of these

31. Integrate the following :
(i) $6x$ (ii) x^7 (iii) $x^7 - 6x + 8$

32. Integrate the following :
(i) $2x^{-4}$ (ii) $\dfrac{x^{-4}}{2} + x^2$ (iii) $-x^{-4} + x - 1$

33. Integrate the following :
(i) $-\dfrac{2}{x^4}$ (ii) $\dfrac{1}{2x^4}$ (iii) $x^4 - \dfrac{1}{x^4}$

34. Integrate the following :
(i) $\dfrac{2}{3}x^{-1/3}$ (ii) $\dfrac{1}{3}x^{-2/3}$ (iii) $-\dfrac{1}{3}x^{-4/3}$

35. Integrate the following :
(i) $\pi \cos \pi x$ (ii) $\dfrac{\pi}{2} \cos \dfrac{\pi x}{2}$ (iii) $\cos \dfrac{\pi x}{2} + \pi \cos x$

36. Integrate the following :
(i) $\csc x \cot x$ (ii) $-\csc 5x \cot 5x$ (iii) $-\pi \csc \dfrac{\pi x}{2} \cot \dfrac{\pi x}{2}$

37. $\displaystyle\int (x + 1)\, dx$

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

38. $\displaystyle\int (5 - 6x)\, dx$
(1) $5x - x^2 + C$ (2) $x - 3x^2 - C$ (3) $5x + 3x^2 + C$ (4) $5x - 3x^2 + C$

39. $\displaystyle\int \left(3t^2 + \dfrac{t}{2}\right) dt$

(1) $t^2 + \dfrac{t^2}{4} - C$ (2) $t^3 + \dfrac{t^2}{4} + C$ (3) $t^3 - \dfrac{t^2}{4} - C$ (4) None

40. $\displaystyle\int \left(\dfrac{t^2}{2} + 4t^3\right) dt$

(1) $\dfrac{t^3}{6} + t^2 + C$ (2) $\dfrac{t^3}{6} + t + C$ (3) $\dfrac{t^3}{6} - t + C$ (4) $\dfrac{t^3}{6} + t^4 + C$

41. $\displaystyle\int x^{-1/3}\, dx$

(1) $\dfrac{3}{2}x^{2/3} + C$ (2) $\dfrac{3}{2}x^{2/5} + C$ (3) $\dfrac{3}{2}x^{1/3} + C$ (4) $\dfrac{3}{2}x^{2/7} + C$

42. $\int \left(\dfrac{\sqrt{x}}{2} + \dfrac{2}{\sqrt{x}} \right) dx$

(1) $\dfrac{x^{\frac{3}{2}}}{3} + 4x^{1/2} + C$

(2) $\dfrac{x^{\frac{3}{2}}}{3} + x^{1/2} + C$

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

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

43. $\int \left(8y - \dfrac{2}{y^{1/4}} \right) dy$

(1) $4y^2 - \dfrac{8}{3} y^{3/4} + C$

(2) $4y^2 + \dfrac{8}{3} y^{3/4} + C$

(3) $y^2 - \dfrac{8}{3} y^{3/4} + C$

(4) $4y^2 - \dfrac{8}{3} y^{1/3} + C$

44. $\int 2x(1 - x^{-3})\, dx$

(1) $x + \dfrac{2}{x} - C$

(2) $x^2 + \dfrac{2}{x} + C$

(3) $2x^2 + \dfrac{2}{x} + C$

(4) $5x^2 + \dfrac{2}{x} + C$

45. $\int (-2\cos t)\, dt$

(1) $-2 \sin t + C$

(2) $-3 \sin t + C$

(3) $-5 \sin t + C$

(4) $-7 \sin t + C$

46. $\int (-5\sin t)\, dt$

(1) $5 \cos t + C$

(2) $2 \cos t - C$

(3) $5 \cosec t + C$

(4) $5 \tan t + C$

47. $\int 7 \sin \dfrac{\theta}{3}\, d\theta$

(1) $-21 \cos \dfrac{\theta}{3} + C$

(2) $-14 \cos \dfrac{\theta}{3} + C$

(3) $-42 \cos \dfrac{\theta}{3} + C$

(4) $-7 \cos \dfrac{\theta}{3} + C$

48. $\int 3\cos 5\theta\, d\theta$

(1) $\dfrac{3}{5} \sin 5\theta + C$

(2) $\dfrac{3}{5} \sin 3\theta + C$

(3) $\dfrac{3}{5} \cos 5\theta + C$

(4) $\dfrac{3}{5} \sec 5\theta + C$

49. $\int (-3 \csc^2 x)\, dx$

(1) $3 \cot x + C$

(2) $\cot x + C$

(3) $3 \tan x + C$

(4) $5 \cot x + C$

50. $\int \left(-\dfrac{\sec^2 x}{3} \right) dx$

(1) $\dfrac{-\tan x}{3} + x$

(2) $\dfrac{-\tan x}{3} + C$

(3) $\dfrac{\tan x}{5} + C$

(4) None

51. $\int \dfrac{\csc \theta \cot \theta}{2}\, d\theta$

(1) $-\dfrac{1}{2} \csc \theta + C$

(2) $-\dfrac{1}{2} \tan \theta + C$

(3) $-\dfrac{1}{2} \cot \theta + C$

(4) $-\dfrac{1}{2} \sec \theta + C$

52. $\int \frac{2}{5} \sec\theta \tan\theta \; d\theta$

(1) $\frac{2}{5} \sec\theta + C$ (2) $\frac{2}{5} \cos\theta + C$ (3) $\frac{2}{5} \tan\theta + C$ (4) $\frac{2}{5} \operatorname{cosec}\theta + C$

53. $\int (4\sec x \tan x - 2\sec^2 x) \; dx$

(1) 4 sec x − 2 tan x + C   (2) 2 sec x − 2 tan x + C
(3) 4 sec x − 3 tan x + C   (4) 4 sec x − 5 tan x + C

54. $\int \frac{1}{2}(\csc^2 x - \csc x \cot x) \; dx$

(1) $-\frac{1}{2}\cot x + \frac{1}{2}\csc x + C$ (2) $\frac{1}{2}\tan x + \frac{1}{2}\csc x + C$

(3) $-\frac{1}{2}\sec x + \frac{1}{2}\csc x + C$ (4) $-\frac{1}{2}\sin x + \frac{1}{2}\csc x + C$

55. $\int (\sin 2x - \csc^2 x) \; dx$

(1) $-\frac{1}{2}\cos 2x - \cot x + C$ (2) $-\frac{1}{2}\cos 2x + \cot x + C$

(3) $-\frac{1}{2}\cos 3x + \cot x + C$ (4) $-\frac{1}{2}\cos 2x + \tan x + C$

56. $\int (2\cos 2x - 3\sin 3x) \, dx$
(1) sin 2x + cos 3x + C   (2) sin 2x + cos 5x + C
(3) sin 2x + cot 3x + C   (4) sin 3x + cos 3x + C

57. $\int \frac{1+\cos 4t}{2} \; dt$

(1) $\frac{t}{2} + \frac{\sin 4t}{8} + C$ (2) $\frac{t}{2} - \frac{\sin 4t}{8} - C$ (3) $\frac{t}{3} + \frac{\sin 4t}{8} + C$ (4) All of these

58. $\int \frac{1-\cos 6t}{2} \; dt$

(1) $\frac{t}{2} + \frac{\sin 6t}{12} + C$ (2) $\frac{t}{2} - \frac{\sin 6t}{12} + C$ (3) $2x\frac{t}{2} - \frac{\sin 6t}{12} + C$ (4) $\frac{t}{2} - \frac{\sin 6t}{12} + C$

59. $\int (1+\tan^2\theta) \; d\theta$
(1) tan θ + C   (2) cot θ + C   (3) sec θ + C   (4) cosec θ + C

60. $\int\limits_{1/2}^{3/2} (-2x+4) \, dx$

(1) 2 square units   (2) 4 square units   (3) 6 square units   (4) 8 square units

Evaluate definite integrals of following Functions

61. $\int_0^{\pi/2} \theta^2 \, d\theta$

(1) $\dfrac{\pi^3}{24}$

(2) $\dfrac{\pi^2}{12}$

(3) $\dfrac{\pi^2}{36}$

(4) $\dfrac{\pi^2}{48}$

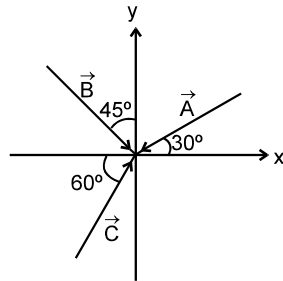**62.** $\int_0^{3b} x^2 \, dx$

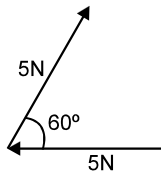(1) $9b^3$

(2) $3b^3$

(3) $27b^3$

(4) $81b^3$

SECTION - (F) : VECTOR BASIC AND ADDITION

1. Vectors $\vec{A}$, $\vec{B}$ and $\vec{C}$ are shown in figure. Find angle between

(i) $\vec{A}$ and $\vec{B}$,   (ii) $\vec{A}$ and $\vec{C}$,   (iii) $\vec{B}$ and $\vec{C}$.

2. The forces, each numerically equal to 5 N, are acting as shown in the Figure. Find the angle between forces?

(1) 90^0

(2) 180^0

(3) 120^0

(4) 160^0

3. The vector joining the points A (1, 1, –1) and B (2, –3, 4) and pointing from A to B is -

(1) $-\hat{i} + 4\hat{j} - 5\hat{k}$

(2) $\hat{i} + 4\hat{j} + 5\hat{k}$

(3) $\hat{i} - 4\hat{j} + 5\hat{k}$

(4) $-\hat{i} - 4\hat{j} - 5\hat{k}$.

4. A vector of magnitude 30 and direction eastwards is added with another vector of magnitude 40 and direction Northwards. Find the magnitude and direction of resultant with the east.

(1) 45, 50^0 with East

(2) 53, 75^0 with East

(3) 53, 50^0 with East

(4) 50, 53^0 with East

5. The vector sum of the forces of 10 N and 6 N can be

(1) 2 N

(2) 8 N

(3) 18 N

(4) 20 N.

6. The vector sum of two force P and Q is minimum when the angle θ between their positive directions, is

(1) $\dfrac{\pi}{4}$

(2) $\dfrac{\pi}{3}$

(3) $\dfrac{\pi}{2}$

(4) π.

7. The vector sum of two vectors $\vec{A}$ and $\vec{B}$ is maximum, then the angle θ between two vectors is -

(1) 0^0
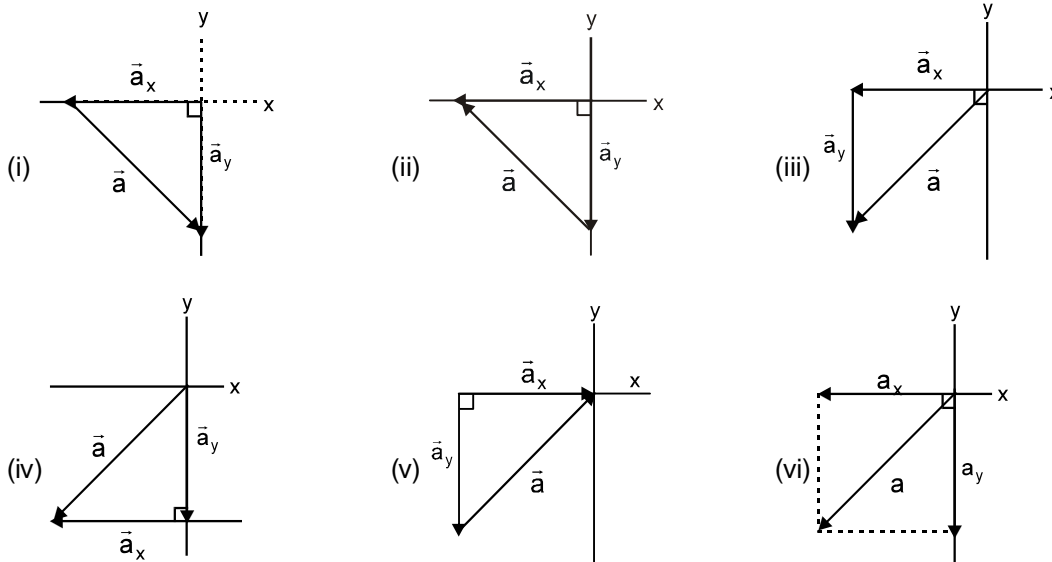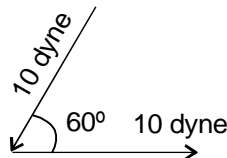
(2) $30°$

(3) $45°$

(4) $60°$

8. Find the magnitude of $3\hat{i} + 2\hat{j} + \hat{k}$?

(1) $\sqrt{10}$ (2) $\sqrt{11}$ (3) $\sqrt{13}$ (4) $\sqrt{14}$

9. If $\vec{A} = 3\hat{i} + 4\hat{j}$ then find $\hat{A}$

(1) $\dfrac{3\hat{i} + 2\hat{j}}{3}$ (2) $\dfrac{2\hat{i} + 3\hat{j}}{5}$ (3) $\dfrac{3\hat{i} + 4\hat{j}}{5}$ (4) $\dfrac{3\hat{i} - 2\hat{j}}{5}$

10. One of the rectangular components of a velocity of 60 km h⁻¹ is 30 km h⁻¹. Find other rectangular component?

(1) $30\sqrt{3}$ km h⁻¹.   (2) $20\sqrt{3}$ km h⁻¹.   (3) $30\sqrt{2}$ km h⁻¹.   (4) $30\sqrt{2}$ km h¹.

11. The x and y components of a force are 2 N and – 3 N. The force is

(1) $2\hat{i} - 3\hat{j}$ (2) $2\hat{i} + 3\hat{j}$ (3) $-2\hat{i} - 3\hat{j}$ (4) $3\hat{i} + 2\hat{j}$

12. A force of 30 N is inclined at an angle θ to the horizontal. If its vertical component is 18 N, find the horizontal component & the value of θ .

(1) 24 N ; 37⁰ approx   (2) 20 N ; 47⁰ approx   (3) 25 N ; 35⁰ approx   (4) 37 N ; 24⁰ approx

13. The angle θ between directions of forces $\vec{A}$ and $\vec{B}$ is 90⁰ where A = 8 dyne and B = 6 dyne. If the resultant $\vec{R}$ makes an angle α with $\vec{A}$ then find the value of 'α' ?

(1) 47⁰   (2) 37⁰   (3) 75⁰   (4) 120⁰

14. If $\vec{A} = 3\hat{i} + 4\hat{j}$ and $\vec{B} = \hat{i} + \hat{j} + 2\hat{k}$ then find out unit vector along $\vec{A} + \vec{B}$

(1) $\dfrac{4\hat{i} + 3\hat{j} - 2\hat{k}}{\sqrt{45}}$ (2) $\dfrac{2\hat{i} - 5\hat{j} - 2\hat{k}}{\sqrt{45}}$ (3) $\dfrac{4\hat{i} - 2\hat{j} + 2\hat{k}}{\sqrt{55}}$ (4) $\dfrac{4\hat{i} + 5\hat{j} + 2\hat{k}}{\sqrt{45}}$

15. The x and y components of vector $\vec{A}$ are 4m and 6m respectively. The x,y components of vector $\vec{A} + \vec{B}$ are 10m and 9m respectively. Find the length of $\vec{B}$ and angle that $\vec{B}$ makes with the x axis.

(1) $5\sqrt{3}$, $\tan^{-1}\dfrac{1}{2}$ (2) $3\sqrt{5}$, $\tan^{-1}\dfrac{1}{2}$ (3) $3\sqrt{5}$, $\tan\dfrac{1}{3}$ (4) $2\sqrt{3}$, $\tan^{-1}\dfrac{1}{2}$

16. A vector is not changed if
(1) it is displaced parallel to itself   (2) it is rotated through an arbitrary angle
(3) it is cross-multiplied by a unit vector   (4) it is multiplied by an arbitrary scalar.

17. If the angle between two forces increases, the magnitude of their resultant
(1) decreases   (2) increases
(3) remains unchanged   (4) first decreases and then increases

18. Which of the following sets of displacements might be capable of bringing a car to its returning point?
(1) 5, 10, 30 and 50 km   (2) 5, 9, 9 and 16 km
(3) 40, 40, 90 and 200 km   (4) 10, 20, 40 and 90 km

19. When two vector $\vec{a}$ and $\vec{b}$ are added, the magnitude of the resultant vector is always
(1) greater than (a + b)   (2) less than or equal to (a + b)
(3) less than (a + b)   (4) equal to (a + b)

20. If $|\vec{A} + \vec{B}| = |\vec{A}| = |\vec{B}|$, then the angle between $\vec{A}$ and $\vec{B}$ is
(1) 0⁰   (2) 60⁰   (3) 90⁰   (4) 120⁰.

21. Vector $\vec{A}$ is of length 2 cm and is 60⁰ above the x-axis in the first quadrant. Vector $\vec{B}$ is of length 2 cm and 60⁰ below the x-axis in the fourth quadrant. The sum $\vec{A} + \vec{B}$ is a vector of magnitude -
(1) 2 along + y-axis   (2) 2 along + x-axis   (3) 1 along – x axis   (4) 2 along – x axis

22*. Which of the following is/are true statement?
(1) A vector cannot be divided by another vector
(2) Angular displacement can either be a scalar or a vector.
(3) Since addition of vectors is commutative therefore vector subtraction is also commutative.
(4) The resultant of two equal forces of magnitude F acting at a point is F if the angle between the two forces is 120^0.

23. In the Figure which of the ways indicated for combining the x and y components of vector a are proper to determine that vector?
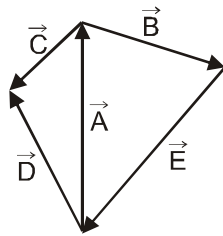

(1) (iii)   (2) (iv)   (3) (vi)   (4) (i), (ii) and (v).

24. Two vectors having equal magnitude of 5 units, have an angle of 60^0 between them. Find the magnitude of their resultant vector and its angle from one of the vectors.

(1) 5, 20^0 (2) $5\sqrt{3}$, 30^0 (3) 3, 40^0 (4) 4, 50^0

25. Two forces each numerically equal to 10 dynes are acting as shown in the figure, then find resultant of these two vectors.
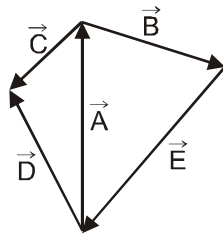

(1) 5 dyne   (2) 10 dyne   (3) 15 dyne   (4) 25 dyne

26. The magnitude of pairs of displacement vecotrs are given. Which pairs of displacement vectors cannot be added to give a resultant vector of magnitude 13 cm?
(1) 4 cm, 16 cm   (2) 20 cm, 7 cm   (3) 1 cm, 15 cm   (4) 6 cm, 8 cm

27. If $\vec{A} = 3\hat{i} + 2\hat{j}$ and $\vec{B} = 2\hat{i} + 3\hat{j} - \hat{k}$, then find a unit vector along $\left(\vec{A} - \vec{B}\right)$.

(1) $\dfrac{\hat{i} + \hat{j} - \hat{k}}{\sqrt{3}}$ (2) $\dfrac{\hat{i} - \hat{j} + \hat{k}}{\sqrt{3}}$ (3) $\dfrac{\hat{i} - \hat{j} - \hat{k}}{\sqrt{3}}$ (4) $\dfrac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{3}}$

28. If $\hat{n}$ is a unit vecotr in the direction of the vector $\vec{A}$, then :-

(1) $\hat{n} = \dfrac{\vec{A}}{|\vec{A}|}$ (2) $\hat{n} = \vec{A}\,|\vec{A}|$ (3) $\hat{n} = \dfrac{|\vec{A}|}{\vec{A}}$ (4) $\hat{n} = \hat{n} \times \vec{A}$

29. The resultant of $\vec{A}$ and $\vec{B}$ makes an angle α with $\vec{A}$ and β with $\vec{B}$, then :

(1) $\alpha < \beta$ (2) $\alpha < \beta$ if $A < B$ (3) $\alpha < \beta$ if $A > B$ (4) $\alpha < \beta$ if $A = B$

30. If $\vec{P} + \vec{Q} = \vec{P} - \vec{Q}$ and θ is the angle between $\vec{P}$ and $\vec{Q}$, then

(1) $\theta = 0^0$ (2) $\theta = 90^0$ (3) $P = 0$ (4) $Q = 0$

31. The magnitudes of sum and difference of two vectors are same, then the angle between them is

(1) 90^0 (2) 40^0 (3) 45^0 (4) 60^0

32. The projection of a vector $3\hat{i} + 4\hat{k}$ on y-axis is :

(1) 5   (2) 4   (3) 3   (4) zero

33. Two forces of 12N and 8N act upon a body. The resultant force on the body has a maximum value of :

(1) 4N   (2) 0N   (3) 20 N   (4) 8N

34. In Figure, $\vec{E}$ equals

(1) $\vec{A}$ (2) $\vec{B}$ (3) $\vec{A} + \vec{B}$ (4) $-(\vec{A} + \vec{B})$

35. In figure, $\vec{D} - \vec{C}$ equals

(1) $\vec{A}$ (2) $-\vec{A}$ (3) $\vec{B}$ (4) $-\vec{B}$

36. In Figure, $\vec{E} + \vec{D} - \vec{C}$ equals

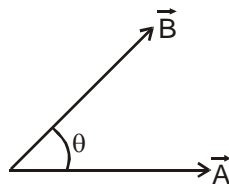(1) $\vec{A}$ (2) $-\vec{A}$ (3) $\vec{B}$ (4) $-\vec{B}$

37. Forces proportional to AB, BC and 2CA act along the sides of triangle ABC in order. Their resultant represented in magnitude and direction as

(1) CA   (2) AC   (3) BC   (4) CB

38. A given force is resolved into components P & Q equally inclined to it . Then :

(1) P = 2 Q   (2) 2 P = Q   (3) P = Q   (4) none of these

39. A particle starting from the origin (0, 0) moves in a straight line in the (x, y) plane. Its coordinates at a later time are ($\sqrt{3}$, 3). The path of the particle makes with the x-axis an angle of :

(1) 30⁰   (2) 45⁰   (3) 60⁰   (4) 0⁰

SECTION - (G) : VECTOR MULTIPLICATION

1. If $\vec{A} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{B} = 2\hat{i} + \hat{j}$ find (a) $\vec{A} \cdot \vec{B}$ (b) $\vec{A} \times \vec{B}$

(1) 3 and $-\hat{i} + 2\hat{j} - \hat{k}$ (2) 5 and $\hat{i} + 2\hat{j} - \hat{k}$ (3) 1 and $-\hat{i} + 2\hat{j} + \hat{k}$ (4) 3 and $-\hat{i} - 2\hat{j} + \hat{k}$

2. If $|\vec{A}| = 4, |\vec{B}| = 3$ and $\theta = 60°$ in the figure , Find (a) $\vec{A} \cdot \vec{B}$ (b) $|\vec{A} \times \vec{B}|$

(1) 3 and $6\sqrt{3}$ (2) 6 and $3\sqrt{3}$ (3) 6 and $3\sqrt{6}$ (4) 6 and $6\sqrt{3}$

3. Three non zero vectors $\vec{A}, \vec{B} \& \vec{C}$ satisfy the relation $\vec{A} \cdot \vec{B} = 0$ & $\vec{A} \cdot \vec{C} = 0$. Then $\vec{A}$ can be parallel to :

(1) $\vec{B}$ (2) $\vec{C}$ (3) $\vec{B} \cdot \vec{C}$ (4) $\vec{B} \times \vec{C}$

4. If $\vec{A} = 4\hat{i} + n\hat{j} - 2\hat{k}$ and $\vec{B} = 2\hat{i} + 3\hat{j} + \hat{k}$, then find the value of n so that $\vec{A} \perp \vec{B}$.

(1) n = 2   (2) n = – 1   (3) n + 2   (4) n = – 2

5. If $\vec{F} = (4\vec{i} - 10\vec{j})$ and $\vec{r} = (5\vec{i} - 3\vec{j})$, then calculate torque $(\vec{\tau} = \vec{r} \times \vec{F})$.

(1) $-38\hat{k}$ (2) $-35\hat{k}$ (3) $-55\hat{k}$ (4) $-28\hat{k}$

6. Find a unit vector perpendicular to both the vectros $(2\hat{i} + 3\hat{j} + \hat{k})$ and $(\hat{i} - \hat{j} + 2\hat{k})$.

(1) $\hat{n} = \pm \dfrac{1}{\sqrt{83}}(7\hat{i} + 3\hat{j} + 5\hat{k})$ (2) $\hat{n} = \pm \dfrac{1}{\sqrt{83}}(-7\hat{i} - 3\hat{j} + 5\hat{k})$

(3) $\hat{n} = \pm \dfrac{1}{\sqrt{83}}(7\hat{i} - 3\hat{j} - 5\hat{k})$ (4) $\hat{n} = \pm \dfrac{1}{\sqrt{58}}(7\hat{i} - 3\hat{j} - 5\hat{k})$

7. Which of the following vector identites is false?

(1) $\vec{P} + \vec{Q} = \vec{Q} + \vec{P}$ (2) $\vec{P} + \vec{Q} = \vec{Q} \times \vec{P}$ (3) $\vec{P}.\vec{Q} = \vec{Q}.\vec{P}$ (4) $\vec{P} \times \vec{Q} \neq \vec{Q} \times \vec{P}$

8. Area of a parallelogram, whose diagonals are $3\hat{i} + \hat{j} - 2\hat{k}$ and $\hat{i} - 3\hat{j} + 4\hat{k}$ will be :

(1) 14 unit   (2) $5\sqrt{3}$ unit   (3) $10\sqrt{3}$ unit   (4) $20\sqrt{3}$ unit

9. If $\vec{A} = \hat{i} + \hat{j}$ and $\vec{B} = \hat{i} - \hat{j}$

The value of $(\vec{A} + \vec{B}) \cdot (\vec{A} - \vec{B})$ is :

(1) $\sqrt{2}$ (2) 0   (3) $\dfrac{1}{2}$ (4) 2

10. Vectors $\vec{A} = \hat{i} + \hat{j} - 2\hat{k}$ and $\vec{B} = 3\hat{i} + 3\hat{j} - 6\hat{k}$ are :
(1) Parallel   (2) Antiparallel
(3) Perpendicular   (4) at acute angle with each other

11. If two vectors are given as :

$\vec{A} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{B} = -\hat{i} - \hat{j} + \hat{k}$

then the vector which is not perpendicular to $(\vec{A} \times \vec{B})$ is:

(1) $-2\hat{i} + 4\hat{j} + 2\hat{k}$ (2) $\hat{i} + \hat{j} + \hat{k}$ (3) $25\hat{i} - 625\hat{j} - 25\hat{k}$ (4) $3\hat{i} - 2\hat{j} - 3\hat{k}$

12. If a verctor $2\hat{i} + 3\hat{j} + 8\hat{k}$ is perpendicular to the vector $4\hat{j} - 4\hat{i} + \alpha\hat{k}$, then the value of α is :

(1) -1 (2) $\dfrac{1}{2}$ (3) $-\dfrac{1}{2}$ (4) 1

13. If the angle betwen the vectors $\vec{A}$ and $\vec{B}$ is θ, the value of the product $(\vec{B} \times \vec{A}) \cdot \vec{A}$ is equal to :
(1) $BA^2 \cos\theta$ (2) $BA^2 \sin\theta$ (3) $BA^2 \sin\theta \cos\theta$ (4) zero

14. $\vec{A}$ and $\vec{B}$ are two vectors and θ is the angle between them, if $\left|\vec{A} \times \vec{B}\right| = \sqrt{3} \ (\vec{A} \bullet \vec{B})$ the value of θ is :

(1) 60^0 (2) 45^0 (3) 30^0 (4) 90^0

15. Two forces P and Q acting at a point are such that if P is reversed, the direction of the resultant is turned through 90^0. Then

(1) P = Q   (2) P = 2Q   (3) P = $\dfrac{Q}{2}$ (4)No relation between P and Q.

16. The vector sum of two forces is perpendicular to their vector differences. In that case, the forces :
(1) are not equal to each other in magnitude   (2) cannot be predicted
(3) are equal to each other   (4) are equal to eah other in magnitude

17. If $|\vec{A} \times \vec{B}| = \sqrt{3} \ \vec{A} \cdot \vec{B}$, then the value of $|\vec{A} + \vec{B}|$ is :

(1) $(A^2 + B^2 + AB)^{1/2}$ (2) $\left(A^2 + B^2 + \dfrac{AB}{\sqrt{3}}\right)^{1/2}$ (3) A + B   (4) $(A^2 + B^2 + \sqrt{3}\ AB)^{1/2}$

ANSWER KEY

PART- I

SECTION - (A) :

1. (4) **2.** (4) **3.** (1) **4.** (3) **5.** (2) **6.** (2)

SECTION - (B) :

1. (1) **2.** (3) **3.** (3) **4*.** (1,3,4) **5*.** (1,2,3) **6.** (1)

SECTION - (C) :

1. (2) **2.** (3) **3.** (4)

SECTION - (D) :

1. (1) **2.** (3) **3.** (4) **4.** (1) **5.** (3) **6.** (2) **7.** (1)

8. (1) **9.** (2) **10.** (3) **11.** (4) **12.** (2) **13.** (3) **14.** (2)

15. (3) **16.** (1) **17.** (1) **18.** (2) **19.** (3) **20.** (2) **21.** (2)

22. (1) **23.** (3) **24.** (2) **25.** (4) **26.** (1) **27.** (1) **28.** (4)

29. (2) **30.** (1) **31.** (2) **32.** (1) **33.** (1) **34.** (1) **35.** (1)

SECTION - (E) :

1. (4) **2.** (3) **3.** (4) **4.** (1) **5.** (3) **6.** (2) **7.** (1)

8. (2) **9.** (1) **10.** (i) $\dfrac{x^{16}}{16} + C$ (ii) $-2\,x^{-1/2} + C$ (iii) $x^{-6}/2 + \ln x + C$

(iv) $x^2/2 + \ln x + 2x + C$

(v) $x^2/2 + \ln x + C$ (vi) $-a/x + b\ln x + C$

11. (2)

12. (i) GMm/R (ii) $Kq_1q_2\left[\dfrac{1}{r_2} - \dfrac{1}{r_1}\right]$ (iii) $M\left[\dfrac{v^2}{2} - \dfrac{u^2}{2}\right]$

(iv) ∞ (v) 1   (vi) 1   (vii) 2

13. (1) **14.** (4) **15.** (1) **16.** (1) **17.** (2) **18.** (3) **19.** (2)

20. (2) **21.** (2) **22.** (3) **23.** (2) **24.** (2) **25.** (2) **26.** (1)

27. (4) **28.** (1) **29.** (1) **30.** (1)

31. (i) $3x^2 + C$ (ii) $\dfrac{x^8}{8} + C$ (iii) $\dfrac{x^8}{8} - 3x^2 + 8x + C$

32. (i) $\dfrac{-2}{3x^3} + C$ (ii) $\dfrac{-x^{-3}}{6} + \dfrac{x^3}{3} + C$ (iii) $\dfrac{x^{-3}}{3} + \dfrac{x^2}{2} - x + C$

33. (i) $\dfrac{2}{3x^3} + C$ (ii) $\dfrac{-x^{-3}}{6} + C$ (iii) $\dfrac{x^5}{5} + \dfrac{1}{3x^3} + C$

34. (i) $x^{2/3} + C$ (ii) $x^{1/3} + C$ (iii) $x^{-1/3} + C$

35. (i) $\sin \pi x + C$ (ii) $\sin \dfrac{\pi x}{2} + C$ (iii) $\dfrac{2}{\pi} \sin \dfrac{\pi x}{2} + \pi \sin x + C$

36. (i) $- \csc x + C$ (ii) $\dfrac{1}{5} \csc (5x) + C$ (iii) $2 \csc \left(\dfrac{\pi x}{2} \right) + C$

37.	(2)	**38.**	(4)	**39.**	(2)	**40.**	(4)	**41.**	(1)	**42.**	(1)	**43.**	(1)
44.	(2)	**45.**	(1)	**46.**	(1)	**47.**	(1)	**48.**	(1)	**49.**	(1)	**50.**	(2)
51.	(1)	**52.**	(1)	**53.**	(1)	**54.**	(1)	**55.**	(2)	**56.**	(1)	**57.**	(1)
58.	(2)	**59.**	(1)	**60.**	(1)	**61.**	(1)	**62.**	(1)				

SECTION - (F) :

1.	(i) 105º , (ii) 150º , (iii) 105º.	**2.**	(3)	**3.**	(3)	**4.**	(4)	**5.**	(2)				
6.	(4)	**7.**	(1)	**8.**	(4)	**9.**	(3)	**10.**	(1)	**11.**	(1)	**12.**	(1)
13.	(2)	**14.**	(4)	**15.**	(2)	**16.**	(1)	**17.**	(1)	**18.**	(2)	**19.**	(2)
20.	(4)	**21.**	(2)	**22*.**	(1,2,4)	**23.**	(1,2,3)	**24.**	(2)	**25.**	(2)	**26.**	(3)
27.	(3)	**28.**	(1)	**29.**	(3)	**30.**	(4)	**31.**	(1)	**32.**	(4)	**33.**	(3)
34.	(4)	**35.**	(1)	**36.**	(4)	**37.**	(1)	**38.**	(3)	**39.**	(3)		

SECTION - (G) :

1.	(1)	**2.**	(4)	**3.**	(4)	**4.**	(4)	**5.**	(1)	**6.**	(3)	**7.**	(2)
8.	(3)	**9.**	(2)	**10.**	(1)	**11.**	(2)	**12.**	(3)	**13.**	(4)	**14.**	(1)
15.	(1)	**16.**	(4)	**17.**	(1)								