CLASS-12TH(MATHEMATICS) PAPER-1

1. The are bounded by $y = \sec^{-1} x$, $y = \text{cosec}^{-1}x$ and $x - 1 = 0$ is

(A) $\left(\log(3+2\sqrt{2})-\frac{\pi}{2}\right)$sq.units

(B) $\left(\frac{\pi}{2}-\log(3+2\sqrt{2})\right)$sq.units

(C) $(\pi-\log_e 3)$ sq. units

(D) None of these

Sol. []

2. The are of the loop of the curve, $ay^2 = x^2(a - x)$ is

(A) $4a^2$. Sq. units (B) $\frac{8a^2}{15}$ sq. units

(C) $\frac{16a^2}{9}$ sq. units (D) None of these

Sol. []

3. The area enclosed by the cvrves, $xy^2 = a^2(a - x)$ and $(a - x)y^2 = a^2x$ is

(A) $(\pi - 1)a^2$ sq. units (B) $(4 - \pi)a^2$ sq. units

(C) $\pi a^2/3$ sq. units (D) None of these

Sol. []

4. The gradient of the curve passing through the point (4, 0) is given by $\frac{dy}{dx}-\frac{y}{x}+\frac{5x}{(x+2)(x-3)}=0$. If the point (5, a) lies on the curve, then the value of 'a' is

(A) $5\ln\frac{7}{12}$ (B) $\frac{67}{12}$ (C) $5\sin\frac{7}{12}$ (D) None of these

Sol. []

5. If for the differential equation $y'=\frac{y}{x}+\phi\left(\frac{x}{y}\right)$, the general solution is $y=\frac{x}{\log|Cx|}$, then $\phi(x/y)$ is given by

(A) $-x^2/y^2$ (B) y^2/x^2 (C) x^2/y^2 (D) $-y^2/x^2$

Sol. []

6. If $\phi(x)$ is a differentiable function, then the solution of the differential equation $dy+\{y\phi'(x)-\phi(x)\phi'(x)\}dx=0$ is

(A) $y=\{\phi(x)-1\}+ce^{-\phi(x)}$ (B) $y\phi(x)=\{\phi(x)\}^2+c$

(C) $ye^{\phi(x)}=\phi(x)e^{\phi(x)}+c$ (D) $y-\phi(x)=\phi(x)e^{-\phi(x)}$

Sol. []

7. The position vector of P is

(A) $\hat{i}-\hat{j}+3\hat{k}$ (B) $\hat{i}-\hat{j}$ (C) $2\hat{i}-\hat{j}-3\hat{k}$ (D) $\hat{i}+\hat{j}+3\hat{k}$

Sol. []

8. The volume of tetrahedron ABCF is

(A) $\frac{7}{3}$ cubic units (B) $\frac{7}{5}$ cubic units

(C) $\frac{3}{5}$ cubic units (D) 7 cubic units

Sol. []

9. The rectangle ABCD of dimension r and 2r is folded along diagonal BD such that planes ABD and CBD are perpendicular to each other, then the distance AC" (in new position is)

(A) $\sqrt{3}r$ (B) $\sqrt{85}r$ (C) $\sqrt{\frac{85}{5}}r$ (D) $\sqrt{\frac{17}{5}}r$

Sol. []

10. Suppose AB is a diameter of a circle and P is a plane through AB making an angle θ with the plane of the circle. If diameter of the circle be 2a, then the eccentricity of the curve of projection of the circle on P is

(A) sin θ (B) $\frac{2a\sin\theta}{1+a}$ (C) $\frac{a\sin\theta}{1+a}$ (D) $1+\sin^2\theta$

Sol. []

11. A plane makes intercepts OA, OB, OC whose measures are a, b, c on the axes OX, OY, OZ. The area of the triangle ABC is

(A) $\sqrt{a^4+b^4+c^4-a^2b^2-b^2c^2-c^2a^2}$ (B) $\frac{1}{2}\sqrt{a^2b^2+b^2c^2+c^2a^2}$

(C) $a^2+b^2+c^2-bc-ca-ab$ (D) $\frac{1}{4}\sqrt{(a+b+c)(b+c+a)(c+a-b)(a+b-c)}$

Sol. []

Multiple choice Questions

12. Which of the following have the same bounded area ?

(A) $f(x) = \sin x$, $g(x) = \sin^2 x$, where $0 \le x \le 10\pi$

(B) $f(x) = \sin x$, $g(x) = |\sin x|$, where $0 \le x \le 10\pi$

(C) $f(x) = |\sin x|$, $g(x) = \sin^3 x$, where $0 \le x \le 10\pi$

(D) $f(x) = \sin$, $g(x) = \sin 4x$, where $0 \le x \le 10\pi$

Sol. []

13. The differential equation $\frac{d^2x}{dy^2} + y + \cot^2 x = 0$ must be satisfied by

(A) $2 + c_1 \cos x + \sqrt{c_2} \sin x$ (B) $\cos x . \ln\left(\tan\frac{x}{2}\right) + 2$

(C) $2 + c_1 \cos x + c_2 \sin x + \cos x \log\left(\tan\frac{x}{2}\right)$ (D) all the above

Sol. []

14. The curve for which the area of the triangle formed by the x-axis, the tangent line and radius vector of the point of tangency is equal to a^2 is

(A) $x = cy + \frac{a^2}{y}$ (B) $y = x - cx^2$ (C) $y = cx + \frac{a^2}{x}$ (D) $x = cy - \frac{a^2}{y}$

(where c is arbitrary constant)

Sol. []

15. The x-y plane in rotated about its line of intersection with the y-z plane by 45°, then the equation of the new plane is/are

(A) z + x = 0 (B) z – y = 0 (C)x + y + z = 0 (D) z – x = 0

Sol. []

Matrix

16. **Column-I** **Column-II**

(A) If $\vec{a} + \vec{b} + \vec{c} = \alpha\vec{d}, \vec{b} + \vec{c} + \vec{d} = \beta\vec{a}$ and $\vec{a}, \vec{b}, \vec{c}$ are non-coplanar then $|\vec{a} + \vec{b} + \vec{c} + \vec{d}|$ is

(B) If $\vec{a}$ and $\vec{b}$ are unit vectors inclined at an angle θ to each other and $|\vec{a} + \vec{b}| < 1$, then θ can be equal to

(C) If $\vec{a}$ units vector perpendicular to another unit vector $\vec{b}$ then $|\vec{a} \times [\vec{a} \times \{\vec{a} \times (\vec{a} \times \vec{b})\}]|$ is equal to

(D) Let $\vec{a}, \vec{b}, \vec{c}$ be three unit vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$, then the angle between $\vec{a}$ and $\vec{b}$ equal to

Sol. []

Integer Type

17. The are of the region bounded between the curves $|y| - |\sin| \geq 0$ and $x^2 + y - \pi^2 < 0$ is $\pi^3 - A$. Find the value of A.

Sol. []

18. If 14 + lnk be the area bounded by the curves $|y| = e^{-|x|} - \frac{1}{2}$ and $\frac{|x|+|y|}{2} + \left|\frac{|x|-|y|}{2}\right| \le 2$ then k is equal to

Sol. []

19. Area of the region bounded by the curve $y = \{x^2\}$, where {.} denotes fractional part function $\forall x \in [-2,2]$ is $p\left(\sqrt{q}+\sqrt{r}-\frac{7}{3}\right)$. Find the value of p + q + r.

Sol. []

20. Two point P and Q are given in the rectangular Cartesian co-ordinates on the curve y = 2x+2, such that $\overrightarrow{OP}\,\hat{i} = -1$ and $\overrightarrow{OQ}\,\hat{i} = 2$, where $\hat{i}$ is a unit vector along the x-axis. The magnitude of the vector $\overrightarrow{OQ} - 4\overrightarrow{QP}$, is 2k, where k equal.

Sol. []

21. If the ratio in which the plane $\vec{r}.(\vec{r} - 2\vec{j} + 3\vec{k}) = 17$ divides the line joining the points $-2\vec{i} + 4\vec{j} + 7\vec{k}$ and $3\vec{i} - 5\vec{j} + 8\vec{k}$ is $\frac{a}{b}$, then |a – b|=

Sol. []