CLASS-12TH(MATHEMATICS) PAPER-2

1. The area bounded by $y = 2 - |2 - x|, y = \frac{3}{|x|}$ is

(A) $\left(\frac{5 - 4\ln 2}{2}\right)$sq.units.

(B) $\left(\frac{2 - \ln 3}{2}\right)$sq.units.

(C) $\left(\frac{4 - 3\ln 3}{2}\right)$sq.units.

(D) None of these

Sol. []

2. If $f(x) = \begin{cases} \sqrt{\{x\}}, & x \notin z \\ 1, & x \in z \end{cases}$ and $g(x) = \{x\}^2$, (where$\{.\}$denotes fractional part of x), then area bounded by f(x) and g(x) for $x \in [0,10]$ is

(A) 5/3

(B) 5

(C) 10/3

(D) None of these

Sol. []

3. The value of S_0 is

(A) $\frac{1}{2}(1 + e^{\pi})$ sq. units

(B) $\frac{1}{2}(1 + e^{-\pi})$ sq. units

(C) $\frac{1}{2}(1 - e^{-\pi})$ sq. units

(D) $\frac{1}{2}(e^{\pi} - 1)$ sq. units

Sol. []

4. The solution of $\frac{xdx + ydx}{xdy - ydx} = \sqrt{\frac{a^2 - x^2 - y^2}{x^2 + y^2}}$ is

(A) $\sqrt{x^2 + y^2} = a\left\{\sin\left(\tan^{-1}\frac{y}{x} + c\right)\right\}$

(B) $\sqrt{x^2 + y^2} = a\cos\left\{\left(\tan^{-1}\frac{y}{x} + c\right)\right\}$

(C) $\sqrt{x^2 + y^2} = a\left\{\tan\left(\sin^{-1}\frac{y}{x} + c\right)\right\}$

(D) None of these

Sol. []

5. Let $\vec{a} = 2\hat{i} + \hat{j} - 2k, \vec{b} = \hat{i} + \hat{j}$. If $\vec{c}$ is a vector such that $\vec{a} \bullet \vec{c} = |\vec{c}|, |\vec{c} - \vec{a}| = 2\sqrt{2}$ and the angle between $\vec{a} \times \vec{c}$ and $\vec{c}$ is 30°, then $|(\vec{a} \times \vec{b}) \times \vec{c}|$ equal :

(A) $\frac{1}{2}$ (B) $\frac{3\sqrt{3}}{2}$ (C) 3 (D) $\frac{3}{2}$

Sol.[]

6. If $\hat{x}, \hat{y}$ and $\hat{z}$ are three unit vectors in three- dimensional space, then the minimum value of $|\hat{x} + \hat{y}|^2 + |\hat{y} + \hat{z}|^2 + |\hat{z} + \hat{x}|^2$

(A) $\frac{3}{2}$ (B) 3 (C) $3\sqrt{3}$ (D) 6

Sol. []

7. The sequence $S_0, S_1, S_2, \ldots$ forms a G.P. with common ratio

(A) $\frac{e^{\pi}}{2}$ (B) $e^{-\pi}$ (C) e^{π} (D) $\frac{e^{-\pi}}{2}$

Sol. []

8. Choose the incorrect statements

(A) The order of differential equation $\sqrt{1 + \frac{d^2y}{dx^2}} = x$ is 1.

(B) The solution of differential equation $xdy - ydx = \sqrt{x^2 + y^2}$ is $y + \sqrt{x^2 + y^2} = cx^2$.

(C) $\frac{d^2y}{dx^2} = 2\left(\frac{dy}{dx} - y\right)$ differential equation of family curves $y = e^x$ (A cos x + B sin x.)

(D) The solution of differential equation $(1 + y^2) + (x - 2e\tan^{-1} y)\frac{dy}{dx} = 0$ is

$xe^{\tan^{-1}} y = e^{2\tan^{-1}} y + k$

Sol. []

9. Let Q be the foot of perpendicular from the origin to the plane 4x – 3y + z + 13 = 0 and R be a point (–1, –6) on the plane. Then length OR is :

(A) $\sqrt{14}$ (B) $\sqrt{\frac{19}{2}}$ (C) $3\sqrt{\frac{7}{2}}$ (D) $\frac{3}{\sqrt{2}}$

Sol. []

10. Equation of the line of the shortest distance between the line $\frac{x}{1} = \frac{y}{-1} = \frac{z}{1}$ and $\frac{x-1}{0} = \frac{y+1}{-2} = \frac{z}{1}$ is:

(A) $\frac{x}{1} = \frac{y}{-1} = \frac{z}{-2}$ (B) $\frac{x-1}{1} = \frac{y+1}{-1} = \frac{z}{-2}$ (C) $\frac{x-1}{1} = \frac{y+1}{-1} = \frac{z}{1}$ (D) $\frac{x}{-2} = \frac{y}{1} = \frac{z}{2}$

Sol. []

11. The median AD of the triangle ABC is bisected at E, BE meets AC in F, then AF : AC =

(A) 3 : 4 (B) 1 : 3 (C) 1 : 2 (D) 1 : 4

Sol. []

Multiple choice Questions

12. y = f(x) and y = (x) are two continuous positive functions intersecting only at three points (0, 1), (3, 4) and (5, 6). A function h(x) = max. f(x),

$(f(x), g(x))$ defined as $h(x) = \begin{cases} f(x), & 0 \le x < 3 \\ g(x), & 3 \le x \le 5 \end{cases}$

If $\int_0^5 f(x)dx = a$, $\int_0^5 g(x)dx = b, \int_3^5 f(x)dx = c, \int_0^3 g(x)dx = d$,

then

(A)

Sol. []

13. 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) $x = cy - \frac{a^2}{y}$

14. Let $\vec{x}, \vec{y}$ and $\vec{z}$ be three vectors each of magnitude $\sqrt{2}$ and the angle between each pair of them is $\frac{\pi}{3}$. If $\vec{a}$ is a non-zero vector perpendicular to $\vec{x}$ and $\vec{y} \times \vec{z}$ and $\vec{b}$ is non –zero vector perpendicular to $\vec{y}$ and $\vec{z} \times \vec{x}$, then

(A) $\vec{b} = \left(\vec{b} . \vec{z}\right)\left(\vec{z} - \vec{x}\right)$ (B) $\vec{a} = \left(\vec{a} . \vec{y}\right)\left(\vec{y} - \vec{z}\right)$

(C) $\vec{a} . \vec{b} = -\left(\vec{a} . \vec{y}\right)\left(\vec{b} . \vec{z}\right)$ (D) $\vec{a} = -\left(\vec{a} . \vec{y}\right)\left(\vec{z} - \vec{y}\right)$

15. A rod of length 2 units whose one end is (1, 0 –1) and other end touches the plane x–2y + 2z + 4 = 0, then

(A) The rod sweeps the figure whose volume is 3π cubic units.

(B) The area of the region which the rod traces on the plane is 2π.

(C) The length of the projection of the rod on the plane is $\sqrt{3}$ units

(D) The centre of the region which the rod traces on the plane is (4/3, –2/3, 1/3)

16.

Column-I	**Column-II**
(A) If the plane $ax - by + cz = d$ contains the line $\frac{x-a}{a} = \frac{y-2d}{b} = \frac{z-c}{c}$, then $\frac{b}{d}$ is equal to	(p) 0
(B) The distance of the point (1, –2, 3) from the plane	(q) 1

$x-y+z-5=0$ measured parallel to $\frac{x}{2}=\frac{y}{3}=\frac{z-1}{-6}$ is equal to

(C) If the straight line $\frac{x-2}{1}=\frac{y-3}{1}=\frac{4-z}{k}$ and $\frac{x-1}{k}=\frac{y-4}{2}=\frac{z-5}{1}$ intersect then k is equal to (r) 2

(D) If a line makes an angle θ with x and y-axis then $\cot\theta$ can be equal to (s) $\frac{1}{3}$

(t) -3

17. If the total area between the curves $f(x) = \cos^{-1}(\sin x)$ and $g(x) = \sin^{-1}(\cos x)$ on the interval $[0, 98\pi]$ is A, then find the last digit of A (Given $\pi = 22/7$).

18. If the differential equation corresponding to $y=\sum_{i=1}^{3} C_i e^{m_i x}$ where C_i's are arbitrary constants and m_1, m_2, m_3 are roots

19. ABCD is a regular tetrahedron; A is the origin; AB is the x-axis; ABC lies in the xy-plane; AB = d. Under these conditions the number of possible tetrahedra is

20. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three non-coplanar unit vectors such that angle between every pair of them is $\frac{\pi}{3}$. If $\vec{a}\times\vec{b}+\vec{b}\times\vec{c}=p\vec{a}+q\vec{b}+r\vec{c}$, where p, q and r are scalars, then the value of $\frac{p^2+2q^2+r^2}{q^2}$ is

21. L_1 and L_2 are two lines whose vector equations are L_1 $\vec{r}=\lambda\left(\left(\cos\theta+\sqrt{2}\right)\hat{i}+(\sqrt{2}\sin\theta)\hat{j}+(\cos\theta-\sqrt{3})\hat{k}\right)$

$L_2:\vec{r}=\mu(a\hat{i}+b\hat{j}+c\hat{k})$, where λ and μ are scalars and α is the acute angle between L_1 and L_2. If the angle 'α' (independent of θ) is equal to $\frac{\pi}{k}$, then k =