MATHS

BOOKS - VGS PUBLICATION-BRILLIANT

MODEL PAPER 12

Section A Very Short Answer Type Questions

1. If the function f is defined by $f(x) = \begin{cases} 3x-2, & x > 3 \\ x^2-2, & -2 \le x \le 2 \\ 2x-1, & x < -3 \end{cases}$

then find the values, if exist, of (i) $f(4)$

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2. Find the domain of the real function $\log(x^2-4x+3)$

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3. Construct a 3×2 matrix whose elements are defined by $a_{ij} = \frac{1}{2}|i - 3j|$

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4. IF $A = \begin{bmatrix} 2 & 4 \\ -1 & k \end{bmatrix}$ and $A^2 = 0$ then find the value of k

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5. If $\bar{a} = 2\bar{i} + 5\bar{j} + \bar{k}$ and $\bar{b} = 4\bar{i} + m\bar{j} + n\bar{k}$ are collinear vectors then find m,n.

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6. Find the vector equation of the line passing through the points $2\bar{i} + \bar{j} + 3\bar{k}$ and $-4\bar{i} + 3\bar{j} - \bar{k}$.

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7. If the vectors $2\bar{i} + \lambda\bar{j} - \bar{k}$ and $4\bar{i} - 2\bar{j} + 2\bar{k}$ are perpendicular to each other than find λ.

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8. If $\sec\theta + \tan\theta = 5$, find the quadrant in which θ lies and find the value of $\sin\theta$.

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9. Prove that $\sin^2 52\frac{1}{2} - \sin^2 22\frac{1}{2}$.

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10. $(\cos hx - \sin hx)^n$ =

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Section B Short Answer Type Questions

1. If $A = \begin{bmatrix} 1 & -2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{bmatrix}$ then show that $A^3 - 3A^2 - A - 3I = O$, where I is unit matrix of order 3

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2. If the points whose position vectors are $3\bar{i} - 2\bar{j} - \bar{k}, 2\bar{i} + 3\bar{j} - 4\bar{k}, \ -\bar{i} + \bar{j} + 2\bar{k}, 4\bar{i} + 5\bar{j} + \lambda\bar{k}$ are coplanar, then show that $\lambda = -\frac{146}{17}$.

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3. If $\bar{a} = 2\bar{i} + 3\bar{j} + 4\bar{k}, \bar{b} = \bar{i} + \bar{j} - \bar{k}, \bar{c} = \bar{i} - \bar{j} + \bar{k},$ compute $\bar{a}x\left(\bar{b}x\bar{c}\right)$ and verify that it is perpendicular to $\bar{a}$.

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4. Prove that $\sin 78^\circ + \cos 132^\circ = \frac{\sqrt{5}-1}{4}$.

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5. Solve the equation $1 + \sin^2\theta = 3\sin\theta\cos\theta$.

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6. $\tan\left[\cos^{-1}\frac{4}{5} + \tan^{-1}\frac{2}{3}\right] =$

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7. If $a=(b-c)\sec\theta$, then prove that $\tan\theta=\frac{2\sqrt{bc}}{b-c}\frac{\sin A}{2}$.

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Section C Long Answer Type Questions

1. If $f: A \to B$ and $g: B \to A$ are two functions such that $gof = I_A$ and $fog = I_B$ then $g = f^{-1}$.

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2. Prove that $a + ar + ar^2 + \ldots\ldots + n\text{terms} = \frac{a(r^n+1)}{r-1}, r \neq 1$

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3. $\begin{vmatrix} a-b-c & 2b & 2c \\ 2a & b-c-a & 2c \\ 2a & 2b & c-a-b \end{vmatrix} =$

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4. Solve the equations $x+y+z=9, 2x+5y+7z=52, 2x+y-z=0,$ by Gauss-Jordan Method.

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5. If $\bar{a} = 2\bar{i} + \bar{j} - 3\bar{k}, \bar{b} = \bar{i} - 2\bar{j} + \bar{k}, \overline{C} = -\bar{i} + \bar{j} - 4\bar{k}, \overline{D} = \bar{i} + \bar{j} + \bar{k}$, then compute $\left|\left(\bar{a} \times \bar{b}\right) \times \left(\bar{c} \times \bar{d}\right)\right|$.

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6. In triangle ABC, prove that $\cos.\frac{A}{2}+\cos.\frac{B}{2}+\cos.\frac{C}{2}=4\cos.\frac{\pi-A}{4}\cos.\frac{\pi-B}{4}\cos.\frac{\pi-C}{4}$

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7. In ΔABC, show that $\frac{ab-r_1r_2}{r_3}=\frac{bc-r_2r_3}{r_1}=\frac{ca-r_3r_1}{r_2}$

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Section A Very Short Answer Type Questions

1. Find the equation of the straight line passing through A(-1,3) and (i) parallel (ii) perpendicular to the straight line passing through B(2,-5),C(4,6)

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2. If the area of the triangle formed by the straight lines $x = 0, y = 0$ and $3x + 4y = a(a > 0$ is 6. Find the value of a.

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3. If (3, 2, -1) (4, 1,-1) and (6,2,5) are three vertices and (4, 2, 2) is the centroid of a tetrahedron, then find the fourth vertex.

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4. Find the equation of the plane whose intercepts on x, y, z axes are 1, 2, 4 respectively.

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5. Show that $\underset{x \to \infty}{\mathrm{Lt}} \sqrt{x^2 + x} - x = \frac{1}{2}$.

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6. Compute $\underset{x \to 0}{\mathrm{Lt}} \dfrac{1 - \cos 2mx}{\sin^2 nx}(m, n \in Z)$.

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7. If f(x) = log (sec x + tan x), then find f' (x).

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8. Find the derivative of the function $\sin^{-1}\left(3x - 4x^3\right)$.

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9. If an error of 3% occurs in measuring the side of a cube, find the percentage error in its volume.

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10. Find the value of 'c' in Rolle's theorem for the function $f(x) = (x-1)(x-2)(x-3)$ on $[1, 3]$.

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Section B Short Answer Type Questions

1. Find the equation of locus of a point such that the difference of whose distances from (-5,0) and (5,0) is 8

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2. When the axes rotated through an angegle $\frac{\pi}{4}$, find the transformed equation of $3x^2 + 10xy + 3y^2 = 9$.

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3. Find the value of k if the angle between the straight lines $4x - y + 7 = 0, kx - 5y - 9 - 0$ is 45°

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4. Check the continity of the following function at 2 .

$$f(x) = \begin{cases} \frac{1}{2}\left(x^2 - 4\right) & \text{if } \ 0 < x < 2 \\ 0 & \text{if } \ x = 2 \\ 2 - 8x^{-3} & \text{if } \ x > 2 \end{cases}$$

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5. Find the derivative of the function tan 2x from the first principle.

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6. A container in the shape of an inverted cone has height 12 cm and radius 6cm at the top. If it is filled with water at the rate of $12cm^3/\sec$, what is the rate of change in the rate of change in the height of water level when the tank is filled 8 cm?

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7. Show that the area of the triangle formed by the tangent at any point on the curve xy=c, (c $\neq$ 0), with the coordinate axes is constant.

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Section C Long Answer Type Questions

1. Find the circumcentre of the triangle whose sides are $3x-y-5=0, x+2y-4=0$ and $5x+3y+1=0$.

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2. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents two parallel lines then prove that $h^2 = ab$.

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3. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents two parallel lines then prove that $af^2 = bg^2$.

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4. If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents two parallel lines then prove that the distance between the parallel lines is $2\sqrt{\dfrac{g^2 - ac}{a(a+b)}}$ or $2\sqrt{\dfrac{f^2 - bc}{b(a+b)}}$.

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5. Find the angle between the lines joining the origin to the points of intersection of the curve $x^2 + 2xy + y^2 + 2x + 2y - 5 = 0$ and the line 3x-y+1=0.

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6. Find the angle between the lines whose direction cosines satisfy the equaitons $l + m + n = 0, l^2 + m^2 - n^2 = 0.$

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7. If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$, then show that $\frac{dy}{dx} = \frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}.$

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8. S.T the curves $y^2 = 4(x+1), y^2 = 36(9-x)$ intersect orthogonally.

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9. Show that when the curved surface of a is right circular cylinder inscribed in a sphere of radius R is maximum , then the height of the cylinder is $\sqrt{2R}$.

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