MATHS

BOOKS - VGS PUBLICATION-BRILLIANT

MODEL PAPER 11

Section A I Very Short Answer Type Questions

1. If $f: Q \to Q$ is defined by $f(x) = 5x + 4$, find f^{-1}.

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2. Find the domain of the real function $f(x) = \sqrt{4x - x^2}$

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3. If $A = \begin{bmatrix} 2 & 0 & 1 \\ -1 & 1 & 5 \end{bmatrix}, B = \begin{bmatrix} -1 & 1 & 0 \\ 0 & 1 & -2 \end{bmatrix}$ then find (AB')'.

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4. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$ and $2X + A = B$ then find X.

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5. IF the vectors $-3\bar{i} + 4\bar{j} + \lambda\bar{k}, \mu\bar{i} + 8\bar{j} + 6\bar{k}$ are collinear vectors then find $\lambda \& \mu$.

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6. Find the vector equation of the plane passing through the points.

$\vec{i} - 2\vec{j} + 5\vec{k}, -5\vec{j} - \vec{k}$ and $-3\vec{j} + 5\vec{j}$.

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7. Find the angle between the vectors $\vec{i} + 2\vec{j} + 3\vec{k}$ and $3\vec{i} - \vec{j} + 2\vec{k}$.

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8. If $3\sin A + 4\cos A = 5$, then find the value of $4\sin\theta - 3\cos\theta$.

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9. Show that $\cos 42^\circ + \cos 78^\circ + \cos 162^\circ = 0$

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10. If $\sinh x = \frac{3}{4}$ then find $\cosh 2x$ and $\sinh 2x$.

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Section B Ii Short Answer Type Questions

1. IF $3A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$ then show that $A^{-1} = A'$.

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2. Find the vector equation of the plane which passes through the points $2\bar{i} + 4\bar{j} + 2\bar{k}, 2\bar{i} + 3\bar{j} + 5\bar{k}$ and parallel to the vector $3\bar{i} - 2\bar{j} + \bar{k}$. Also find the point where this plane meets the line joining the points $2\bar{i} + \bar{j} + 3\bar{k}$ and $4\bar{i} - 2\bar{j} + 3\bar{k}$.

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3. P.T the smaller angle θ between any two diagonals of a cube is given by $\cos\theta = 1/3$

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4. IF θ is not an integral muliple of $\frac{\pi}{2}$, prove that

$\tan\theta + 2\tan 2\theta + 4\tan 4\theta + 8\cot 8\theta = \cot\theta$

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5. Solve $\sqrt{2}(\sin x + \cos x) = \sqrt{3}$

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6. Prove that $\sin^{-1}\frac{3}{5} + \sin^{-1}\frac{8}{17} = \cos^{-1}\frac{36}{85}$

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7. Prove that $\cot A + \cot B + \cot C = \frac{a^2 + b^2 + c^2}{4\triangle}$.

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Section C Iii Long Answer Type Questions

1. If $f: A \to B, g: B \to C$ are two bijective functions then prove that $gof: A \to C$ is also a bijective function.

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2. Using the principle of finite Mathematical Induction prove the following:

(v) $3.5^{2n+1} + 2^{3n+1}$ is divisible by 17, $\forall n \in N$.

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3. Show that $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3.$

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4. Solve the system of equations by Matrix inverse method, $2x - y + 3z = 8, \ -x + 2y + z = 4, 3x + y - 4z = 0$

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5. If $\vec{a} = \vec{i} - 2\vec{j} - 3\vec{k}, \ \vec{b} = 2\vec{i} + \vec{j} - \vec{k}$ and $\vec{c} = \vec{i} + 3\vec{j} - 2\vec{k}$, verify that $\vec{a} \times \left(\vec{b} \times \vec{c}\right) \neq \left(\vec{a} \times \vec{b}\right) \times \vec{c}$.

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6. If A, B, C are the angles in a triangle then prove that $\sin.\frac{A}{2} + \sin.\frac{B}{2} + \sin.\frac{C}{2} = 1 + 4\sin\left(\frac{\pi - A}{4}\right)\sin\left(\frac{\pi - B}{4}\right)\sin\left(\frac{\pi - C}{4}\right.$

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7. If $r_1 = 2, r_2 = 3, r_3 = 6$ and $r = 1,$ prove that $a = 3, b = 4$ and $c = 5.$

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Section A Very Short Answer Type Questions

1. Find the value of x if the slope of the line passing through (2,5) and $(x, 3)$ is 2.

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2. Transform the equation of $x + y + 1 = 0$ into

Normal form

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3. Show that the points (1,2,3), (2,3,1) and (3,1,2) form an equilateral triangle.

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4. Find the angle between the planes 2x - y + z = 6 and x + y + 2 z = 7 .

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5. Show that $\underset{x \to 0^+}{\text{Lt}} \left\{ \frac{2|x|}{x} + x + 1 \right\} = 3.$

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6. Find $\underset{x \to 0}{\text{Lt}} \frac{e^{3+x} - e^3}{x}$

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7. If $f(x) = a^x . e^{x^2}$ then find $f'(x)$.

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8. A grocer has a sale of Rs. 6435, Rs. 6927, Rs. 6855, Rs. 7230 and Rs. 6562 for 5 consecutive months. How much sale must he have in the sixth month so that he gets an average sale of Rs. 6500?

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9. The average monthly income of P and Q is Rs. 5050. The average monthly income of Q and R is Rs. 6250 and the average monthly income of P and R is Rs. 5200. The monthly income of P is:

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10. 2x+32=24 then find x?

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Section B Short Answer Type Questions

1. A(2,3) and B(-3,4) be two given points. Find the equation of the locus of P so that the area of the triangle PAB is 8.5 sq.units.

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2. When the axes are rotated through an angle $\pi/6$. Find the transformed equation of $x^2 + 2\sqrt{3}xy - y^2 = 2a^2$.

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3. Find the points on the line $3x - 4y - 1 = 0$ which are at a distance of 5 units from the point (3,2).

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4. Show that

$$f(x) = \begin{cases} \frac{\cos ax - \cos bx}{x^2} & \text{if } x \neq 0 \\ \frac{1}{2}(b^2 - a^2) & \text{if } x = 0 \end{cases}$$ where a and b are real constants is continuous at x = 0.

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5. Find the derivative of sin2x from the first principles .

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6. A particle is moving in a straight line so that after 't' seconds its distance is 'S' (in cms) from a fixed point of the line is given be S=f(t)= $8t + t^3$.

Find (i) the velocity at time t=2 (ii) the initial velocity (iii) acceleration at t=2 sec

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7. A particle is moving along a line according $s = f(t) = 8t + t^3$. Find the initial velocity

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8. A particle is moving in a straight line so that after 't' seconds its distance is 'S' (in cms) from a fixed point of the line is given be S=f(t)= $8t + t^3$.

Find (i) the velocity at time t=2 (ii) the initial velocity (iii) acceleration at t=2 sec

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9. S.T the tangent at any point θ on the curve $x = c\sec\theta, y = c\tan\theta$ is $y\sin\theta = x - \cos\theta$.

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Section C Long Answer Type Questions

1. Find the equation of straight lines passing through (1,2) and making an angle 60° with the line $\sqrt{3}x + y + 2 = 0$.

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2. Show that the area of the triangle formed by the lines $ax^2 + 2hxy + by^2 = 0$ and $lm + my + n = 0$ is $\frac{n^2\sqrt{h^2 - ab}}{|am^2 - 2hlm + bl^2|}$

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3. Find the value if k , if the lines joining the origin with the points of intersection of the curve $2x^2 - 2xy + 3y^2 + 2x - y - 1 = 0$ and the x + 2y = k are mutually perpendicular .

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4. If a line makes angles $\alpha, \beta, \lambda, \delta$ with the four diagonals of a cube, then show that $\cos^2\alpha + \cos^2\beta + \cos^2\lambda + \cos^2\delta = \frac{4}{3}$.

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5. If $x = \frac{3at}{1+t^3}, y = \frac{3at^2}{1+t^3}$ then find $\frac{dy}{dx}$.

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6. At any point t on the curve $x = a(t + \sin t), y = a(1 - \cos t)$ find the lengths of tangent and normal.

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7. A wire of length l is cut into two parts which are bent respectively in the form of a square and a circle. What are the lengths of pieces of wire so that the sum of areas is least ?

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