



MATHS

BOOKS - VGS PUBLICATION-BRILLIANT

MODEL PAPER 9

Section A Very Short Answer Type Questions

1. If $A = \left\{0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}\right\}$ and $f: A \rightarrow B$ is a surjection defined by $f(x) = \cos x$ then find B.



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2. Find the domain of $f(x) = \sqrt{x^2 - 25}$



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3. If A is an invertible matrix and A is also invertible then prove

$$(A^T)^{-1} = (A^{-1})$$



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4. If $A = \begin{bmatrix} 2 & -4 \\ -5 & 3 \end{bmatrix}$ then find $A + A'$ and AA' .



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5. Let $\bar{a} = 2\bar{i} + 4\bar{j} - 5\bar{k}$, $\bar{b} = \bar{i} + \bar{j} + \bar{k}$ and $\bar{c} = \bar{j} + 2\bar{k}$. Find the unit vector in the opposite direction of $\bar{a} + \bar{b} + \bar{c}$.



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6. Find the vector equation of the plane passing through the points $\bar{i} - 2\bar{j} + 5\bar{k}$, $-5\bar{j} - \bar{k}$, $-3\bar{i} + 5\bar{j}$.

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7. If $\bar{a} = (1, -1, -6)$, $\bar{b} = (1, -3, 4)$ and $\bar{c} = (-2, -5, 3)$ then compute $\bar{a} \times (\bar{b} \times \bar{c})$.

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8. Find the extreme values of $7\cos x - 24\sin x + 5$ over \mathbb{R} .

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9. Prove that $\frac{\cos 9^\circ + \sin 9^\circ}{\cos 9^\circ - \sin 9^\circ} = \cot 36^\circ$



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10. $\tanh^{-1}\left(\frac{1}{2}\right) =$



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Section B Short Answer Type Questions

1. If A is a nonsingular matrix, then $\det A^{-1} =$



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2. $\bar{a}, \bar{b}, \bar{c}$ are non coplanar vectors, then prove that four points

$$6\bar{a} + 2\bar{b} - \bar{c}, 2\bar{a} - \bar{b} + 3\bar{c}, -\bar{a} + 2\bar{b} - 4\bar{c}, -12\bar{a} - \bar{b} - 3\bar{c},$$

are coplanar.



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3. Let \bar{a} and \bar{b} be vectors, satisfying $|\bar{a}| = |\bar{b}| = 5$ and $(\bar{a}, \bar{b}) = 45^\circ$. Find the area of the triangle having $\bar{a} - 2\bar{b}$ and $3\bar{a} + 2\bar{b}$ as two of its sides.



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4. Prove that

$$\left(1 + \cos \frac{\pi}{10}\right) \left(1 + \cos \frac{3\pi}{10}\right) \left(1 + \cos \frac{7\pi}{10}\right) \left(1 + \cos \frac{9\pi}{10}\right) = \frac{1}{16}$$



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5. If θ_1, θ_2 are solutions of the equation $a \cos 2\theta + b \sin 2\theta = c$, $\tan \theta_1 \neq \tan \theta_2$ and $a + c \neq 0$, then

find the values of (i) $\tan \theta_1 + \tan \theta_2$ (ii) $\tan \theta_1 \cdot \tan \theta_2$.



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6. Prove that $\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{5}\right) + \tan^{-1}\left(\frac{1}{8}\right) = \frac{\pi}{4}$



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7. In a $\triangle ABC$, if $a:b:c = 7:8:9$, then find $\cos A : \cos B : \cos C$.



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Section C Long Answer Type Questions

1. If $f: A \rightarrow B$ is a bijective function then prove that

(ii) $f^{-1} \circ f = I_A$.



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2. Show that

$$\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \dots + n \text{ terms} = \frac{n}{2n+1}$$



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3. Show that

$$\begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(ab+bc+ca)$$



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4. Solve the system of equations by Matrix inverse method,

$$2x - y + 3z = 8, \quad -x + 2y + z = 4, \quad 3x + y - 4z = 0$$



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5. Prove that in any triangle, the altitudes are concurrent by vector method.



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6. IF A, B, C are angles of a triangle , Prove that

$$\cos 2A + \cos 2B + \cos 2C = -4 \cos A \cos B \cos C - 1$$



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7. In a ΔABC if $r_1 = 8, r_2 = 12, r_3 = 24$ find a, b, c .



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