



MATHS

BOOKS - TELUGU ACADEMY MATHS (TELUGU ENGLISH)

IPE:MAY-2016(TS)

Questions

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



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2. Find the rank of $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

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3. Let $\vec{a} = \vec{i} + 2\vec{j} + 3\vec{k}$ & $\vec{b} = 3\vec{i} + \vec{j}$. Find a unit vector in the direction of $\vec{a} + \vec{b}$

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4. Find the vectore equation of the line passing through the point $2\vec{i} + \vec{j} + 3\vec{k}$ parallel to vector $4\vec{i} - 2\vec{j} + 3\vec{k}$.

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5. IF the vectors $2\vec{i} + \lambda\vec{j} - \vec{k}$, $4\vec{i} - 2\vec{j} + 2\vec{k}$ are perpendicular to each other then find λ .

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6. Find the maximum and minimum value of $f(x) = 3 \cos x + 4 \sin x$

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7. Show that $\frac{1}{\sin 10^\circ} - \frac{\sqrt{3}}{\cos 10^\circ} = 4$

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8. If $A = \{-2, -1, 0, 1, 2\}$ and $f: A \rightarrow B$ is a surjection defined by $f(x) = x^2 + x + 1$ then find B.

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9. If $f(y) = \frac{y}{\sqrt{1-y^2}}$, $g(y) = \frac{y}{\sqrt{1+y^2}}$ then show that $f \circ g(y) = y$.

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10. IF $\sinh x = 3/4$ then find $\cosh 2x$ and $\sinh 2x$.

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11. If $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $E = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ then show that $(aI + bE)^3 = a^3I + 3a^2bE$ where I is identify matrix of order 2.

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12. Show that the four points $-\bar{a} + 4\bar{b} - 3\bar{c}$, $3\bar{a} + 2\bar{b} - 5\bar{c}$, $-3\bar{a} + 8\bar{b} - 5\bar{c}$, $-3\bar{a} + 2\bar{b} + \bar{c}$ are coplanar, where \bar{a} , \bar{b} , \bar{c} are non-coplanar vectors.

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13. Find the distance of a point (2,5,-3) from the planer $r.(6i - 3j + 2k) = 4$

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14. For $A \in R$, P.T (i)

$$\sin A \sin\left(\frac{\pi}{3} + A\right) \sin\left(\frac{\pi}{3} - A\right) = \frac{1}{4} \sin 3A \quad \text{(ii)}$$

$$\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = 3/16$$

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

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16. Prove that $2 \sin^{-1}\left(\frac{3}{5}\right) - \cos^{-1}\frac{5}{13} = \cos^{-1}\left(\frac{323}{325}\right)$.

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17. Prove that $\cot \frac{A}{2} + \cot \frac{B}{2} + \cot \frac{C}{2} = \frac{s^2}{\Delta}$

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

(i) $f \circ f^{-1} = I_B$

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19. Using the principle of finite Mathematical Induction prove that

$$2.3 + 3.4 + 4.5 + \dots \text{ upto } n \text{ terms} = \frac{n(n^2 + 6n + 11)}{3}$$

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20. 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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21. By using Cramer's solve

$$x + y + z = 1, 2x + 2y + 3z = 6, x + 4y + 9z = 3$$

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22. IF $\bar{a} = \bar{i} - 2\bar{j} - 3\bar{k}$, $\bar{b} = 2\bar{i} + \bar{j} - \bar{k}$ and

$$\bar{c} = \bar{i} + 3\bar{j} - 2\bar{k}, \text{ find } \bar{a} \cdot (\bar{b} \times \bar{c}).$$



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23. 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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24. In a $\triangle ABC$ if $r_1 = 8, r_2 = 12, r_3 = 24$ find a, b, c .

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Section 1

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. Find the centroid of the tetrahedron whose vertices are $(2,3,-4)$ $(-3,3,-2)$, $(-1,4,2)$, $(3,5,1)$

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3. Find the direction cosines of the normal to the plane $x + 2y + 2z - 4 = 0$

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4. Evaluate $\lim_{x \rightarrow 0} \frac{e^x - \sin x - 1}{x}$

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5. Is f defined by $f(x) = \begin{cases} \frac{\sin 2x}{x} & \text{if } x \neq 0 \\ 1 & \text{if } x = 0 \end{cases}$ continuous?

?

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6. Find $\frac{d}{dx} (\sec \sqrt{\tan x})$.

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7. If $y = \sin^{-1}(\cos x)$ then find $\frac{dy}{dx}$



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8. If the increase in the side of a square is 4% then find the approximate percentage of increase in the area of the square.



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9. Verify Rolle's theorem for the functions
 $f(x) = x(x + 3)e^{-x/2}$ on $[-3,0]$



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1. Find the equation of the locus of P, if $A=(2,3)$, $B=(2,-3)$ and $PA + PB = 8$.

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2. Find the transformed equation of

$3x^2 + 10xy + 3y^2 = 9$ when the axes are rotated through an angle $\frac{\pi}{4}$

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3. Find the equation of the line perpendicular to the line $3x + 4y + 6 = 0$ and making intercept -4 on X-axis.

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4. Find $\lim_{x \rightarrow a} \left(\frac{x \sin a - a \sin x}{x - a} \right)$

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5. If $y = a \cos(\sin x) + b \sin(\sin x)$ then prove that $y'' + (\tan x)y' + y \cos^2 x = 0$.

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6. S.T the curves $6x^2 - 5x + 2y = 0$, $4x^2 + 8y^2 = 3$ touch each other at $\left(\frac{1}{2}, \frac{1}{2} \right)$.

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7. The volume of a cube is increasing at a rate of 8 cubic centimeters per second. How fast is the surface area increasing when the length of the edge is 12 cm?

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Section 3

1. Find the circumcentre of the triangle whose vertices are (1,3) (0,-2) and (-3,1).

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2. Write down the equation of the pair of straight lines joining the origin to the points of intersection of the $6x - y + 8 = 0$ with the pair of straight lines $3x^2 + 4xy - 4y^2 - 11x + 2y + 6 = 0$. Show that the lines so obtained make equal angles with the coordinates axes.

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3. 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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4. If $x^y + y^x = a^b$ then prove that

$$\frac{dy}{dx} = - \left[\frac{yx^{y-1} + y^x \log y}{x^y \log x + xy^{x-1}} \right].$$

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5. Find the length of subtangent subnormal at a point t on the curve $x = a(\cos t + \sin t)$, $y = a(\sin t - t \cos t)$

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6. The profit function $p(x)$ of a company, selling x items per day is given by $p(x) = (150 - x)x - 1600$. Find the number of items that the company should sell to get maximum profit. Also find the maximum profit.



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