MATHS

BOOKS - MODERN PUBLICATION

MOCK TEST-3

Exercise

1. Write the element a_{12} of the matrix $A = \left[a_{ij}\right]_{2 \times 2}$, whose elements are given by : $a_{ij} = e^{2ix} \sin jx$

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2. Given : $\int e^x(\tan x + 1)\sec x dx = e^x f(x) + c$, write f(x) satisfying the above.

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3. Determine order and degree (if defined) of differential equation: $\frac{d^4y}{dx^4} + \sin(y'''') = 0$

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4. Find $\left|\vec{x}\right|$, if for a unit vector $\vec{a}$, $\left(\vec{x} - \vec{a}\right).\left(\vec{x} + \vec{a}\right) = 15$

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5. By using elementary transformations, find the inverse of the matrix $A = \begin{bmatrix} 1 & 3 \\ 2 & 7 \end{bmatrix}$.

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6. Using determinant , find the area of triangle with verticles

(1,0) , (6,0) ,(4,3)

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7. Find $\frac{dy}{dx}$ if $x = a(\theta + \sin\theta), y = a(1 - \cos\theta)$

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8. Prove that the function f given by f(x) = log sin x is strictly increasing on $\left(0, \frac{\pi}{2}\right)$ and strictly decreasing on $\left(\frac{\pi}{2}, \pi\right)$.

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9. Find the equation of the tangent to the curve $x^2 + 3y = 3$, which is parallel to the line y - 4x + 5 = 0

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10. Evaluate : $\int\left[\log(\log x)+\frac{1}{(\log x)^2}\right]dx.$

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11. Solve : $xyy'=1+x+y+xy.$

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12. If $\vec{a}$ is any vector in space, show that : $\vec{a}=\left(\vec{a}\cdot\hat{i}\right)\hat{i}+\left(\vec{a}\cdot\hat{j}\right)\hat{j}+\left(\vec{a}\cdot\hat{k}\right)\hat{k}.$

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13. Prove that :

$$2\tan^{-1}\left(\frac{1}{2}\right)+\tan^{-1}\left(\frac{1}{7}\right)=\tan^{-1}\left(\frac{31}{17}\right)$$

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14. Solve: $\tan^{-1}2x+\tan^{-1}3x=\frac{\pi}{4}$

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15. If $A=\begin{bmatrix}2 & -1\\ -1 & 2\end{bmatrix}$,show that $A^2-4A+3I=0.$

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16. If $A = \begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$, prove that :

$A^{-1} = A^2 - 6A + 11I$

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17. Without expanding, prove the following

$$\begin{vmatrix} b+c & c+a & a+b \\ q+r & r+p & p+q \\ y+z & z+x & x+y \end{vmatrix} = 2 \begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix}$$

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18. If the function defined by :

$$f(x) = \begin{cases} 2x - 1 & x < 2 \\ a & x = 2 \\ x + 1 & x > 2 \end{cases}$$ is continuous at x =2, find the value of 'a'. Also discuss the continuity of f(x) at x =3.

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19. Differentiate the following w.r.t.x.

$x^{\cot x} + (\sin x)^x$.

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20. Evalute : $\int \frac{5x+3}{\sqrt{x^2+4x+10}}dx$

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21. Evaluate : $\int_0^{\pi} \frac{x \sin x}{1+\cos^2 x}dx.$

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22. Evaluate : $\int_0^{\frac{\pi}{2}} \frac{\cos^2 x}{\cos^2 x + 4\sin^2 x}dx$

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23. For the differential equation, find the particular solution satisfying the given condition: $(x+y)dy+(x-y)dx=0, y=1$ when $x=1$

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24. Find the vector equation of the line parallel to the line : $\frac{x-1}{5}=\frac{3-y}{2}=\frac{z+1}{4}$ and passing through (3,0,-4). Also find the distance between these two lines.

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25. Find the equation of the plane passing through the point (1, -1 , 2) and perpendicular to the planes $2x + 3y - 2z = 5$ and $x + 2y - 3z = 8$.

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26. A speaks truth in 60% of the cases, while B in 90% of the cases. In what percentage are they likely to contradict each other in stating the same fact? In the case of contradiction do you think , the statement of B will carry more weight as he speaks truth in more number of case than A?

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27. Consider $f: R \to [-5, \infty)$ given by $f(x) = 9x^2 + 6x - 5$. Show that f is invertible. Find the inverse of f.

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28. Consider the binary operations $* : R \times R \to R$ and $o: R \times R \to R$ defined as a * b = |a-b| and a o b = a for all a,b in R`. Show that '*' is commutative but not associative, 'o' is associative but not commutative.

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29. Show that a cylinder of given volume, open at the top, has minimum total surface area if its height is equal to radius of the base.

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30. Using integration find the area of region bounded by the triangle where vertices are : (1,3),(2,5) and (3,4)

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31. Show that the points : $A\left(-2\hat{i}+3\hat{j}+5\hat{k}\right), B\left(\hat{i}+2\hat{j}+3\hat{k}\right)$ and $C\left(7\hat{i}-\hat{k}\right)$

are collinear.

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32. Show that the lines $\frac{x-a+d}{\alpha-\delta}=\frac{y-a}{\alpha}=\frac{z-a-d}{\alpha+\delta}$ and $\frac{x-b+c}{\beta-\gamma}=\frac{y-b}{\beta}=\frac{z-b-c}{\beta+\gamma}$ are coplanar.

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33. Two tailors A and B earn Rs 150 and Rs 200 per day respectively. A can stitch 6 shirts and 4 pants while B can stitch 10 shirts and 4 pants per day. How many days shall each work it it is desired to produce

(at least) 60 shirts ands 32 pants at a minimum labour cost? Solve the problem graphically.

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34. A coin is biased so that the head is 3 times as likely to occur as tail. If the coin is tossed 3 times, find the probability distribution of number of tails.

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35. There see three coins,one is a two headed coin (having head on both the faces),another is a biased coin that comes up heads 75% of the time and the

third is anunbiased coin.One of the three coins is choosen at random and tossed.Of it shows head,what is probability that it was the two headed coin?


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