MATHS

BOOKS - MODERN PUBLICATION

MOCK TEST-1

Exercise

1. For what value of 'x', is the matrix $A = \begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ x & -3 & 0 \end{bmatrix}$ a skew-symmetric matrix.

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2. Evaluate : $\int \frac{1}{x(\log x)^m} dx, m > 0$

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3. Solve : $\frac{dy}{dx} = \sqrt{9 - y^2}$

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4. Find the angle between the vectors $\vec{a} = \hat{i} - \hat{j} + \hat{k}$ and $\hat{b} = \hat{i} + \hat{j} - \hat{k}$.

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5. Construct a 3×4 matrix, whose elements are given by: $a_i j = \frac{1}{2}| - 3i + j|$

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6. If A_{ij} is the co-factor of the element a_{ij} of the determinant $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$, then write the value of $a_{32} \cdot A_{32}$

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7. If x sin (a+y) + sin a cos (a+y) = 0, then prove that : $\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}$

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8. Prove that the function f given by $f(x) = x^2 - x + 1$ is neither strictly increasing nor decreasing on $(-1, 1)$.

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9. Find the approximate change in the volume V of a cube of side x metres caused by increasing the side by 1%.

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10. Evaluate $\int_{\pi/6}^{\pi/3} \left(\frac{1}{1+\sqrt{\tan x}} \right.$ dx

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11. Solve the following differential equations

$x dy + \left(y - x^3\right) dx = 0$

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12. Find the value of $'\lambda'$ such that the vectors : $3\hat{i} + \lambda\hat{j} + 5\hat{k}$, $\hat{i} + 2\hat{j} - 3\hat{k}$ and $2\hat{i} - \hat{j} + \hat{k}$ are coplanar.

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13. $\tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{8} = \frac{\pi}{4}$

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14. Prove that : $\tan^{-1}\left(\frac{\cos x}{1 + \sin x}\right) = \frac{\pi}{4} - \frac{x}{2}, x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

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15. Show that if $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then $A^n = \begin{bmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{bmatrix}$

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16. Using the properties of determinant, show that :

$$\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ac & bc & c^2+1 \end{vmatrix} = 1 + a^2 + b^2 + c^2$$

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17. The funtion f(x) is defined as follows:

$$f(x) = \begin{cases} x^2 + ax + b & 0 \le x < 2 \\ 3x + 2 & 2 \le x \le 4 \\ 2ax + 5b & 4 < x \le 8 \end{cases}$$ If f(s) is continuous on [0,8], find the values of 'a' and 'b'.

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

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19. By using the properties of definite integrals, evaluate the integral:

$\int_0^{\frac{\pi}{2}} (2\log\sin x - \log\sin 2x)dx$

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20. Solve: $\frac{dy}{dx} + \frac{2x}{x^2+1}y = \frac{1}{(x^2+1)^2}, y(0) = 0.$

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21. Find the shortest distance between the lines:

$\vec{r} = 6\hat{i} + 2\hat{j} + 2\hat{k} + \lambda\left(\hat{i} - 2\hat{j} + 2\hat{k}\right)$ and $\vec{r} = -4\hat{i} - \hat{k} + \mu\left(3\hat{i} - 2\hat{j} -$

.

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22. Find the equation of the plane passing through the intersection of the planes: $2x - y + z = 10$ and $x - 2y + 2z = 12$ and parallel to the line with direction ratios <1,2,3>. Find the perpendiccular distance of (2,2,2) from this plane.

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23. A problem in Mathematics is given the three students whose chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$. What is the probability in the following cases ?

: Only one of them solves it correctly.

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24. A problem in Mathematics is given the three students whose chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$. What is the probability in the following cases ?

: At least one of them solves it.

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25. If A and B are subsets of the universal set U, then show that A⊂ AU B.

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26. Is $*$ defined on the set $\{1, 2, 3, 4, 5\}$ by $a \cdot b = L.C.M.ofa$ and b a binary operation? Justify your answer.

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27. If X= {1, 2, 3}, if n represents any member of X, write the following sets containing all numbers represented by (i) 4n (ii) n + 6

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28. Find the area of the smaller region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the straight line $\frac{x}{a} + \frac{y}{b} = 1$ (using integration)

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29. Simplify : $\left[\vec{a}-\vec{b}, \vec{b}-\vec{c}, \vec{c}-\vec{a}\right]$.

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30. If $\vec{a}, \vec{b}, \vec{c}$ are three vectors such that $\vec{a} \times \vec{b}=\vec{c}, \vec{b} \times \vec{c}=\vec{a}$, prove that $\vec{a}, \vec{b}, \vec{c}$ are mutually at right angles and $\left|\vec{b}\right|=1,\left|\vec{c}\right|=\left|\vec{a}\right|$.

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31. Convert the following measurements into mL. 0.75 liters

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32. A class has 15 students whose ages are 14, 17, 15, 14, 21, 17, 19, 20, 16, 18, 20, 17, 16, 19 and 20 years. One student is selected in such a manner that each has the same chance of being chosen and the age X of the selected student is recorded. What is the probability distribution of the random variable X? Find mean, variance and standard deviation of X.

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33. Find the variance of the number obtained on a throw of an unbiased die.

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