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MATHS

BOOKS - MODERN PUBLICATION

TEST PAPER 7

Exercise

1. Find the least positive integer r such that $-375 \in [r]_{11}$

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2. Express the value of $\sin^{-1}\frac{1}{\sqrt{5}} + \cos(-1)\frac{3}{\sqrt{10}}$ in simplest form.

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3. Find B if $B^2 = \begin{bmatrix} 17 & 8 \\ 8 & 17 \end{bmatrix}$

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4. if A is a 3×3 matrix and |A| = 3, then write the matric represented by $A \times adjA$.

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5. If $y = 5^t$ and $t = e^{3x}$. Write the value of $\frac{dy}{dx}$ at x= 0

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6. Write the absolute maximum and absolute minimum of the function $f(x) = \frac{x}{|x|}$ in $[-2, 2]$.

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7. $\int \frac{dx}{e^x + e^{-x}} =$ _____.

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8. Evaluate $\int_0^{1000} e^{x-[x]}\,dx$

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9. Write the parameteric equation of a line through parallel to the vector $3i + j -$ É.

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10. If $\alpha\hat{i} + 3\hat{j} - \hat{k}$ and $2\hat{i} + \hat{j} - \frac{1}{3}\hat{k}$ are parallel then find α .

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11. Let A = R-{2} and B = R - {1}. If f : A $\rightarrow$ B is a function defined by f(x)= $\frac{x-1}{x-2}$ then show that f is one-one and onto. Hence, find f^{-1}.

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12. Given a non-empty set X, Let *: $P(x) \times P(x)$ be defined as $A * B = (A - B) \cup (B - A), \forall A, B \in P(x)$. Show that the empty set ϕ is the identity for the operation * and all the elements A of p(x) are invertible with $A^{-1} = A$.

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13. Let R be a relation on the set A of ordered pairs of positive integers defined by (x, y) R (u, v), if and only if xv = yu. Show that R is an equivalence relation.

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14. Let R be the relation on the set R of real numbers such that aRb iff a-b is and integer. Test whether R is an equivalence relation. If so find the equivalence class of $1 \text{and} \frac{1}{2}$ wrt. This equivalence relation.

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15. An animal feed company must produce 200kg of a mixture consisting of ingredients A and B. The-ingredient A costs Rs.3 per kg and B costs 5 per kg. No more than 80 kg of A can be uséd and at least 60 kg of B must be used. Formulate the problem to minimise thé cost of mixture.

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16. Prove that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$ or $(abc+bc+ca+ab)$

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17. If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ then show that $A^k = \begin{bmatrix} 1+2k & -4k \\ k & 1-2k \end{bmatrix}$, $k \varepsilon N$

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18. Express as a sum of a symmetric and a skew symmetric matrix:

$$\begin{bmatrix} x & a & b \\ a & y & c \\ b & c & z \end{bmatrix}$$

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19. Prove the following : $\begin{bmatrix} \sin\alpha & \cos\alpha & \cos(\alpha+\delta) \\ \sin\beta & \cos\beta & \cos(\beta+\delta) \\ \sin\alpha & \cos\gamma & \cos(\gamma+\delta) \end{bmatrix}$ =0

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20. Test differentiability of the following function at the indicated points.

$$f(x) = \begin{cases} 1-2x & x \leq \frac{1}{2} \\ x - \frac{1}{2} & x > \frac{1}{2} \end{cases} at x = \frac{1}{2}$$

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21. if $x = e^t \sin t$ and $y = e^t \cos t$, then prove that $(x+y)^2 \frac{d^2y}{dx^2} = 2\left(x\frac{dy}{dx} - y\right)$.

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22. If sin (x + y) = y cos (x + y) then prove that

$$\frac{dy}{dx} = -\frac{1+y^2}{y^2}$$

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23. If tangents are drawn from the origin to the curve y = sin x then show that the locus of the point of contact is $x^2y^2 = x^2 - y^2$.

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24. Test the function y = $(x-5)^5(x+2)^2$ for extreme values.

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25. Evaluate : $\int\left(\frac{\sin x\cos x}{\sin 2x}-2\sin x+3\right)dx$.

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26. $\int_0^{\frac{\pi}{2}}\frac{\cos x dx}{(\sin x+1)(\sin x+2)}$

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27. Solve : $\left(x+2y^3\right)\frac{dy}{dx}=y.$

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28. Find the general solution of $\frac{dy}{du} = u + \frac{1}{\sqrt{u}} + 6u + 5.$

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29. Prove the following by vector method. The diagonals of a rhombus are at right angles.

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30. Find the equation of the plane passing through the line of intersection of the planes. $x + 3y + 6 = 0$, $3x - y - 4z = 0$ and the point (1,1,1) .

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31. Find the image of the point (3,5,7) with respect to the plane $2x + y + z = 6.$

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32. Obtain the equation of the line through the point (1, 2, 3) and parallel to the line $x - y + 2z - 5 = 0, 3x + y + z = -6$

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33. Find the inverse of the following matrices using elementary transformation

$$\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$$

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34. Prove the following:

$$\begin{bmatrix} b^2 - ab & b - c & bc - ac \\ ab - a^2 & a - b & b^2 - ab \\ bc - ac & c - a & ab - a^2 \end{bmatrix} = 0$$

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35. Evaluate : $\int \frac{\ln(1+x)}{1+x} dx$

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36. Solve: $x\frac{dy}{dx} + y = y^2 \ln x$

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37. Find the area of the région on closed between $y = 4x - 1$ and $y^2 = 2x$

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38. Prove that lveca+vecbl $\leq ssthan$ or $equal$lvecal+lvecbl .

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39. Find the area of the parallelogram whose diagonals are vectors $3\hat{i} + \hat{j} - 2\hat{k}$ and $\hat{i} - 3\hat{j} + 4\hat{k}$.

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