MATHS

BOOKS - USHA MATHS (ODIA ENGLISH)

PREVIOUS YEAR QUESTION 2019

Previous Year Question

1. If veca=vecb+vecc, then write the value of $\vec{a}\cdot\left(\vec{b}\times\vec{c}\right)$.

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2. Write the value of k such that the line $\frac{x-4}{1}=\frac{y-2}{1}=\frac{z-k}{2}$ lies on the plane $2x-4y+z=7$

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3. A R is a relation on set A such that $R=R^{-1}$, then write the type of the relation R.

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4. Write the value of $\cos^{-1}\cos\left(\frac{3\pi}{2}\right)$.

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5. IF

$$\begin{vmatrix} 1+x & x & x^2 \\ x & 1+x & x^2 \\ x^2 & x & 1+x \end{vmatrix} = a + bx + cx^2 + dx^3 + ex^4 + fx^5$$

then write the value of a.

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6. Let A and B be two mutually exclusive events, such that $P(A) = \frac{1}{2}$ and $P(B) = \frac{1}{3}$. Write the value of $P(A \cup B)$.

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7. If $f'(2^+) = 0$ and $f'(2^-) = 0$, then is $f(x)$ continuous at $x = 2$?

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8. If f is an odd function, then write the value of

$$\int_{-a}^{a} \frac{f(\sin x)}{f(\cos x) + f(\sin^2 x)} dx$$

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9. Write the order of the differential equaiton whose solution is given by $y = (c_1 + c_2)\cos(x + c_3) + c_4 e^{x + c_5}$

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10. 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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11. Solve for x, $2\tan^{-1}(\cos x) = \tan^{-1}(2\text{cosec}x)$.

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12. Prove that :

$$\cos^{-1}\left(\frac{b + a\cos x}{a + b\cos x}\right)$$

` =2"tan"^(-1)(sqrt((a-b)/(a+b)) "tan" x/2)

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13. Construct the multiplication table X_7 on the set {1, 2, 3, 4, 5, 6}. Also find the inverse element of 4 if it exists.

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14. Solve the following : $\begin{bmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{bmatrix}$ =0

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15. A person takes 4 tests in succession. The probability of his passing the first test is p, that of his passing each succeeding test is p or $\frac{p}{2}$ depending on his passing or failing the preceding test, Find the probabilty of his passing

just three tests.

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16. Find the probability distribution of

number of heads in three tosses of a coin.

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17. If $A=\begin{bmatrix}1 & 2 & 0\\ 0 & 1 & 3\\ -2 & 5 & 3\end{bmatrix}$, then verify that $A+A'$ is symmetric and $A-A'$ is skew-symmetric.

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18. If $A=\begin{bmatrix}1 & 2 & 3\\ 3 & -2 & 1\\ 4 & 2 & 1\end{bmatrix}$ "show that" $A^3-23A-40I=0$

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19. Find $\frac{d^2y}{dx^2}$ if x=a $\cos\theta, y=b\sin\theta$.

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20. Verify lagrange's Mean-Value theorem for

$F(x) = x^3 - 2x^2 - x + 3$ on [1,2]

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21. Find the point on the curve $x^2 + y^2 - 4xy + 2 = 0$

where the normal is paralell to the x-asis.

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22. Find the intervals in which the function $y = \frac{\ln x}{x}$ is

increasing and decreasing.

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23. If $y = e^{x^{e^{x^{e^{x}}}}}$, then find $\frac{dy}{dx}$.

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24. Evaluate : $\int_0^{\pi/2} \frac{\cos x dx}{(2-\sin x)(3+\sin x)}$

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25. Find the area of the region bounded by the curve $y = 6x - x^2$ and the x-axis.

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26. Find differential equation of the curve $y = ae^{3x} + be^{5x}$.

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27. Obtain the general solution of the following differential equations.

$(x^2 + 7x + 12)dy + (y^2 - 6y + 5)dx = 0$

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28. Integrate the following $\int \left[\frac{2x+1}{\sqrt{x^2+10x+29}}\right]dx$

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29. Show that $\left(\vec{a} \times \vec{b}\right)^2 = a^2b^2 - \left(\vec{a} \,.\, \vec{b}\right)^2$.

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30. Find the equation of a plane which is at a distance 3 units from the origin and which is normal to the vector $2\hat{i} + 3\hat{j} - 6\hat{k}$.

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31. If l_1, m_1, n_1 and l_2, m_2, n_2 are the direction cosines of two mutually perpendicular lines show that the d.cs. Of the line perpendicular to both of them are

$m_1n_2 - n_1m_2, n_1l_2 - l_1n_2, l_1m_2 - m_1l_2$

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32. Find the point where the line $\frac{x-2}{1} = \frac{y}{-1} = \frac{z-1}{2}$ meets the plane $2x + y + z = 2$.

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33. Find the unit vector in the direction of the vector $\vec{r}_1 - \vec{r}_2$, where $\vec{r}_1 = \hat{i} + 2\hat{j} + \hat{k}$ and $\vec{r}_2 = 3\hat{i} + \hat{j} - 5\hat{k}$

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34. Find the inverse of the following matrices using elementary transformation:

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 1 & 0 & 2 \end{bmatrix}$$

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35. Out of the adult population in a village 50% are farmers, 30% do business and 20% are service holders. It is known that 10% of the farmers, 20% of the business holders and 50% of service holders are above poverty line. What is the probability that a member chosen from any one of the adult population, selected at random, is above poverty line?

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36. Examining consistency and solvability, solve the following equation by matrix method.

x-2y=3

3x+4y-z=-2

5x-3z=-1

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37. Show that the shrtest distance of the point (0, 8a) from the curve $ax^2 = y^3$ is $2a\sqrt{11}$.

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38. If $e^{y/x} = \frac{x}{a+bx}$ then show that $x^3 \frac{d}{dx}\left(\frac{dy}{dx}\right) = \left(x\frac{dy}{dx} - y\right)^2$

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39. Evaluate the following integrals $\int \frac{dx}{2\cos^2 x + 3\cos x}$

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40. Solve $y^2 + x^2\frac{dy}{dx} = xy\frac{dy}{dx}$.

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41. Determine the area common to the parabola $y^2 = x$ and the circle $x^2 + y^2 = 2x$.

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42. Find the distance of the point $(1, -1, -10)$ from the line $\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}$ measured parallelto the line $\frac{x+2}{2} = \frac{y-3}{-3} = \frac{z-4}{8}$

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43. Show by vector method that the four points (6, 2, -1), (2, -1, 3), (-1, 2, -4) and (-12, -1, -3) are coplanar.

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44. Prove that $f: X \to Y$ is injective iff for all

$\subset sA, BofX, f(A \cap B) = f(A) \cap f(B)$.

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45. Maximize: $Z = 10x_1 + 12x_2 + 8x_3$

Subject to: $x_1 + 2x_2 \leq 30$

$5x_1 - 7x_3 \geq 12$

$x_1 + x_2 + x_3 = 20$

$x_1, x_2 \geq 0$

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46. If $\sin^{-1}\left(\frac{x}{a}\right) + \sin^{-1}\left(\frac{y}{b}\right) = \sin^{-1}\left(\frac{c^2}{ab}\right)$,

then prove that $b^2x^2 + 2xy\sqrt{a^2b^2 - c^4} + a^2y^2 = c^4$

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