MATHS

BOOKS - USHA MATHS (ODIA ENGLISH)

PREVIOUS YEAR QUESTION 2017

Previous Year Question

1. Write the minimum value of n such that $\frac{d^n\left(3x^3+7\right)^{15}}{dx^n}=0$

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2. Write the interval in which the function $\sin^2 x - x$ is increasing.

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3. Write the value of $\int_0^1 \{x\} dx$ where {x} stands for fractional part of x.

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4. Write the order of the differential equation of the family of circles $ax^2 + ay^2 + 2gx + 2fy + c = 0$.

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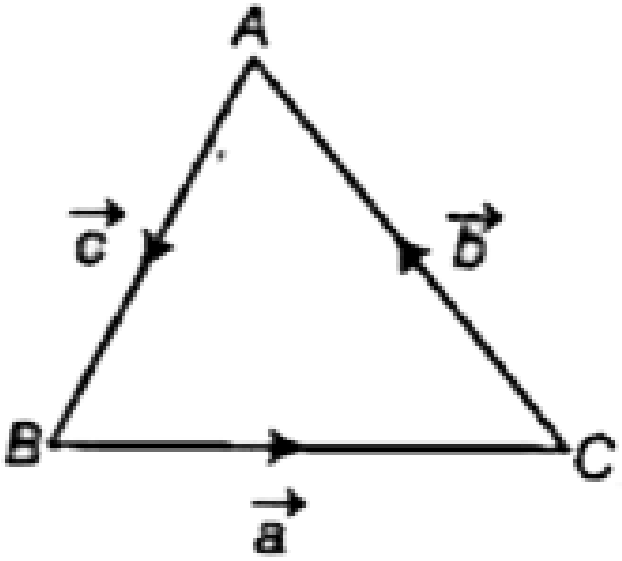
5. It the vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ form the sides $\overrightarrow{BC}, \overrightarrow{CA}$ and $\overrightarrow{AB}$ respectively of a triangle ABC, then write the value of $\vec{a} \times \vec{c} + \vec{b} \times \vec{c}$.



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6. Write the equation of the plane meeting the coordinate axes in A,B and C in order, given that (a,b,c) is the centroid of $\triangle ABC$.

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7. 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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8. If I_n is an identity matrix of order n, then k being a natural number, write the matrix I_n^k.

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9. Write the number of ways in which 5 boys and 5 girls can sit around a round table.

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10. One card is drawn from a pack of 52 cards. Write the probability that the card drawn is either a king

or a spade.

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11. What is the derivative of $\sec^{-1}\left(\frac{1}{2x^2-1}\right)$, with respect to $\left(\sqrt{1-x^2}\right)$?

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12. If $y = x + \frac{1}{x + \frac{1}{x + \ldots \infty}}$ find $\frac{dy}{dx}$, the rhs being a valid expression.

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13. If $U = \ln\left(x^3 + y^3 + z^3 - 3xyz\right)$, show that $\frac{\delta u}{\delta x} + \frac{\delta u}{\delta y} + \frac{\delta u}{\delta z} = \frac{3}{x + y + z}$

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14. $\lim_{x \to 0}$ cos(1/x)

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15. Verify Cauchy's mean value for the functions $f(x) = \sin x, g(x) = \cos x$ in $\left[0, \frac{\pi}{2}\right]$

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16. Find the equation of the normal to the curve $y = (\log x)^2$ at $x = \frac{1}{e}$.

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17. Evaluate $\int_{-1}^{2} \{|x| + [x]\} dx$

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18. $\int_{0}^{a} x^3 \left(a^2 - x^2\right)^{\frac{5}{2}} dx$

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19. Evaluate $\int \frac{dx}{e^{4x} - 5}$

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20. $\int x^2 \tan^{-1} x dx$

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21. Find the particular solution of the following differential equation $\frac{dy}{dx} = \frac{1 + y^2}{1 + x^2}$ given that $y = \sqrt{3}$ when x= 1.

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22. Solve the following differential equation

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

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23. Solve the following second order equations

$$\cos ecx\frac{d^2y}{dx^2} = x$$

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24. Prove that the vectors $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} - 3\hat{j} - 5\hat{k}$, $3\hat{i} - 4\hat{j} - 4\hat{k}$ are the sides of a right angled triangle.

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25. If $\vec{a} = 3\hat{i} + \hat{j} + 2\hat{k}$, $\vec{b} = 2\hat{i} - 3\hat{j} + 4\hat{k}$ then verify that $\vec{a} \times \vec{b}$ is perpendicular to both $\vec{a}$ and $\vec{b}$.

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26. If $\vec{p} = \frac{1}{\lambda}\left(\vec{b} \times \vec{c}\right), \vec{q} = \frac{1}{\lambda}\left(\vec{c} \times \vec{a}\right)$ and $\vec{r} = \frac{1}{\lambda}\left(\vec{a} \times \vec{b}\right)$ where $\lambda = \left[\vec{a}\,\vec{b}\,\vec{c}\right] \neq 0$ then show that $\left(\vec{a} + \vec{b} + \vec{c}\right) \cdot \left(\vec{p} + \vec{q} + \vec{r}\right) = 3.$

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27. Find the equation of the plane through the point (2,1,0) and passing through the intersection of the planes $3x - 2y + z - 1 = 0$ and $x - 2y + 3z = 1.$

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28. Find the co-ordinates of the point where the perpendicular from the origin meets the line joining the points $(-9, 4, 5)$ and $(11, 0, -1)$.

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29. Find the value of a for which the plane $x + y + z - a = 0$ will touch the sphere $x^2 + y^2 + z^2 - 2x - 2y - 2z - 6 = 0$

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30. Find the feasible region of the system. $2y - x \geq 0, 6y - 3x \leq 21, x \geq 0, y \geq 0$

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31. Solve the following LPP graphically: Maximize $z = 20x + 30y$ subject to $3x + 5y \leq 15$, $x \geq 0, y \geq 0/$

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32. Solve by Cramer's rule $2x - y = 2, 3x + y = 13$

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33. If the matrix A is such that $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix} A = \begin{bmatrix} -4 & 1 \\ 7 & 7 \end{bmatrix}$, find A.

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34. Find the inverse of the following matrix:

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

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35. If $P(n-1,3):P(n+1,3)=5:12$, find n.

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36. A cricket team consisting of 11 players is to be chosen from 8 batsmen and 5 bowlers. In how many ways can the team be chosen so as to include at least 3 bowlers.

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37. Write the principal value of $\sin^{-1}\frac{1}{2}+\cos^{-1}\left(-\frac{1}{2}\right)$

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38. Five boys and four girls randomly stand in a line. Find the probability that no two girls come together.

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39. If a random variable X has a binomial distribution $B\left(8, \frac{1}{2}\right)$, then find X for which the outcome is most likely.

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40. If $(a+bx)e^{\frac{y}{x}} = x$, 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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41. A cylindrical open water tank with a circular base is to be made out of 30 sq metres of metal sheet. Find the dimensions so that it can hold maximum water. (Neglect thickness of sheet).

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42. Evaluate $\int \frac{dx}{\cos x(1+2\sin x)}$

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43. Solve $\frac{dx}{dy} = \frac{3x-7y+7}{3y-7x-3}$

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44. Prove the following by vector method. An angle inscribed in a semi-circle is a right angle.

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45. Show that $\hat{i} \times \left(\vec{a} \times \hat{i}\right) + \hat{j} \times \left(\vec{a} \times \hat{j}\right) + \hat{k} \times \left(\vec{a} \times \hat{k}\right) = 2\vec{a}$

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46. Show that the line joining the points $(0, 2, -4)$ and $(-1, 1-2)$ and the lines joining the points $(-2, 3, 3)$ and $(-3, -2, 1)$ are co-plannr. Find their point of intersection.

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47. Solve the following LPP graphically: Maximize: $Z = 4x_1 + 3x_2$ subject to $x_1 + x_2 \leq 50$, $x_1 + 2x_2 \leq 80$,$2x_1 + x_2 \geq 20, x_1, x_2 \geq 0$

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48. Prove the following:

$$\begin{bmatrix} (b+c)^2 & a^2 & bc \\ (c+a)^2 & b^2 & ca \\ (a+b)^2 & c^2 & ab \end{bmatrix}$$

$$=(a^2+b^2+c^2)(a+b+c)(b-c)(c-a)(a-b)$$

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49. Show that:

$$C_1^2 + 2C_2^2 + 3C_3^2 \ldots + nC_n^2 = \frac{(2n-1)!}{\{(n-1)!\}^2}$$

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50. The probability that a student will pass the final examination in both English and Hindi is 0.5 and the probability of passing neither is 0.1. If the probability of passing English examination is 0.75, what is the probability of passing the Hindi Examination?

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51. If P (A) = 0.4,P (B | A)= 0.3 and $P(B^c \mid A^c) = 0.2$. find

P (A | B)

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