MATHS

BOOKS - PRADEEP PUBLICATION

MODEL PAPER (1)

Exercise

1. Consider the set $J_2 = \{0, 1\}$. Consider the composition table for the operation $+_2$ (i.e. addition modulo 2) on J_2

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2. Find the value of $\cos\left(\tan^{-1}\sqrt{x}+\cot^{-1}\sqrt{x}\right)$, where x is a non negative real number.

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3. True or False :

If A is any matrix of order 2×2, then adj (adj A) = A.

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4. At x = 0, the function f(x) = |x| is

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5. If $\vec{a}, \vec{b}, \vec{c}$ are three vectors such that : $\left|\vec{a}\right| = 5, \left|\vec{b}\right| = 12$ and $\left|\vec{c}\right| = 13$ and $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, find the value of $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$.

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6. Find the standard deviation of the Binomial dustribution $B\left(4, \frac{1}{3}\right)$.

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7. Evaluate: $\int \log x dx$

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8. Find $\frac{dy}{dx}$ when $y = \sin\left(\cos^{-1} x\right)$, |x|<1.

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9. Solve the equation 2x-3y=7, 3x+2y=4 using Cramer's rule.

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10. Evaluate $\lim_{x \to \frac{x}{2}} [\sin x]$. If it exists. Here [] denotes the greatest integer function.

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11. Find the equation of the plane containing the points (1,0,0),(0,2,0) and (0,0,3).

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12. Find the probability of throwing a total of 8 in a single toss of a pair dice given that each dice shows up an odd number.

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13. Let f(x)=tanx, $-\frac{\pi}{2}<x<\frac{\pi}{2}$ and g(x)=$\sqrt{1-x^2}$. Describe gof.

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14. The range of the function $f(x) = \dfrac{x^2 - x}{x^2 + 2x}$ is:

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15. Prove that $\tan^{-1}\left(\dfrac{\sqrt{1-x^2}}{1+x}\right) = \dfrac{1}{2}\cos^{-1} x$

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16. If $A = \begin{bmatrix} -1 & 1 & -1 \\ 3 & -3 & 3 \\ 5 & -5 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 54 & 3 \\ 1 & -3 & -3 \\ -1 & 4 & 4 \end{bmatrix}$, find A^2B^2.

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17. Let $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ prove that by induction that $A^n = \begin{bmatrix} 1 & n & n\frac{n+1}{2} \\ 0 & 1 & n \\ 0 & 0 & 1 \end{bmatrix}$ for all $n \in N$.

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18. Let $f(x) = \begin{cases} x + a & x \leq 1 \\ ax^2 + 1 & x > 1 \end{cases}$. Show that f is continuous at 1. Find 'a' so that it is derivable at 1.

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19. If $x = \frac{1 - t^2}{1 + t^2}, y = \frac{2t}{1 + t^2}$, find $\frac{dy}{dx}$ at x=2.

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20. The total cost C(x) and the total revenue R(x) associated with the production and sale of x units of an item are given by

$C(x) = 0.1x^2 + 30x + 1000$ and

$R(X) = 0.2x^2 + 36x - 100.$

Find the marginal cost and mardinal revenue when x=20.

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21. Find the interval of increase and decrease of the function $f(x) = \log(1 + x) - \frac{x}{1 + x}$.

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22. Evaluate $\int (e^x) \frac{dx}{\sqrt{5 - 4e^x - e^{2x}}}, x < 0$.

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23. By examining the chest X-ray, the probability that TB is detected when is actually suffering from TB is 0.99 the probability of a healthy person diagonosed to have TB is 0.001. In a certain city, 1 in 1000 persons suffer from TB. A person is selected at random and is diagonsed to have TB. What is the probability that he/she actually sufferes from TB?

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24. If $\vec{a} = (1, 1, 1), \vec{b} = (0, 1, -1)$ are two given vectors then find a vector $\vec{c}$ satisfying $\vec{a} \times \vec{c} = \vec{b}$ and $\vec{a} . \vec{c} = 3$.

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25. Find the distance of the point (-1, -5, -10) from the point of intersection of the $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$ and the plane x-y + z= 5.

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26. Mathematics teacher of class XII in a school faced an awkward situation when a student Tej complained against

him for awarding 0 mark for the following problem:

"compute the area enclosed between the x-axis, the curve $y = x^3$ and the coordinates x=-1 and x=1".

solution to this problem as given by Tej was as follows:

$$Requiredarea = \int_{-1}^{1} x^3 dx = \left[\frac{x^4}{4}\right]^1 = \frac{1}{4}\left(1^4 - (-1)^4\right) = 0$$

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Tej claimed that the formula used by him is same as given in the book, which states that"Area enclosed between the x-axis, the graph of y=f(x) and the coordinates x=a, x=b is $\int_a^b f(x)dx$, where a**What is the logic in awarding '0' mark to Tej for the solution in reference?**

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

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29. Evaluate $\int \frac{\sin x}{\sin 4x} dx$.

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30. Maximize Z=6x+3y subject to constraints

$x \geq 0, y \geq 0, 4x + y \geq 80, x + 5y \geq 115, 3x + 2y \leq 150.$

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31. Find the shortest distance between the lines. $\frac{x-8}{3}.\frac{y+9}{-16}=\frac{z-10}{7}$ and $\frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}$.

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32. A window has the shape of a rectangle surmounted by an equilateral triangle. If the perimeter of the window is 12 m, find the dimensions of the rectangle that will produce the largest area of the window.

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33. The area lying above x-axis and included between the circle $x^2+y^2=8x$ and the parabola $y^2=4x$ is

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34. Solve the following equations by matrix inverse method.

$$\frac{2}{x}-\frac{3}{y}+\frac{3}{z}=10, \qquad \frac{1}{x}+\frac{1}{y}+\frac{1}{z}=10,$$
$$\frac{3}{x}-\frac{1}{y}+\frac{2}{z}=13.$$

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35. In a college hostel acomodating 1000 students, one of them came in carrying a flue virus, then the hostel was isolated. If the rate at which the virus spreads is assumed to be proportional to the produce of number of infected students and the number of non-infected students and if the number of infected students is 50 after 4 days then

show that more than 95% of the students will be infected after 10 days

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