MATHS

BOOKS - OMEGA PUBLICATION

SAMPLE QUESTION PAPER

Questions

1. The principal value of $\sin^{-1}\left(\sin\dfrac{2\pi}{3}\right)$ is ....

A. $\dfrac{-2\pi}{3}$

B. $\dfrac{2\pi}{3}$

C. $\dfrac{\pi}{3}$

D. none of these

Answer:

2. If $A = \begin{bmatrix} a_{ij} \end{bmatrix}_{\mathrm{mxn}}$ is a rectangular matrix, then

A. $m > n$

B. $m = n$

C. $m < n$

D. none of these

Answer:

3. The derivative of a^x is

    A. $a^x \log a$

    B. a^x

    C. $\dfrac{a^x}{\log a}$

    D. none of these

Answer:

4. Find the rate of change of the area of a circle per second with respect to its radius r when r = 5 cm.

A. $8\pi cm^2/\sec$

B. $10\pi cm^2/\sec$

C. $11\pi cm^2/\sec$

D. none of these

Answer:

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5. Evaluate : $\int \dfrac{dx}{x^2 - 6x + 13}$.

A. $\tan^{-1} \dfrac{x-3}{2} + c$

B. $\dfrac{1}{3}\tan^{-1} \dfrac{x-3}{2} + c$

C. $\dfrac{x+3}{2}\tan^{-1} x + c$

D. $\dfrac{1}{3}\tan^{-1}(x-3) + c$

Answer:

6. The degree of differential equation

$$xy\dfrac{d^2y}{dx^2} + x\left(\dfrac{dy}{dx}\right)^2 - y\dfrac{dy}{dx} = 0 \text{ is}$$

A. 0

B. 2

C. 1

D. none of these

Answer:

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7. Write the value of:

$$\left(\hat{i} \cdot \left(\hat{j} \times \hat{k}\right)\right) + \hat{j}\left(\hat{i} \times \hat{k}\right) + \hat{k} \cdot \left(\hat{I} \times \hat{j}\right)$$

A. 0

B. -1

C. 1

D. 3

Answer:

8. The Projection of vector $\hat{i} - \hat{j}$ on vector $\hat{i} - \hat{j}$ is equal to

A. 1

B. $\dfrac{1}{\sqrt{2}}$

C. 0

D. none of these

Answer:

9. Direction casines of z-axis are

A. (0,0,1)

B. (1,0,0)

C. (0,0,0)

D. (0,1,0)

Answer:

10. If $P(A) = \dfrac{1}{2}, P(B) = 0$ then $P(A \mid B)$ is :

A. 0

B. $\dfrac{1}{2}$

C. not defined

D. 1

Answer:

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11. If $A = \begin{bmatrix} -1 & 2 & 3 \\ 5 & 7 & 9 \\ -2 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & 1 & -5 \\ 1 & 2 & 0 \\ 1 & 3 & 1 \end{bmatrix}$,

then verify that $(A - B)' = A' - B'$

12. Examine the consistency of the system of equations

$: x + 3y = 5, 2x + 6y = 8$

13. Discuss the continuity of the function

$$f(x) = \begin{cases} 3, & \text{if } 0 \le x \le 1 \\ 4, & \text{if } 1 < x < 3 \\ 5, & \text{if } 3 \le x \le 10 \end{cases}$$

14. Prove that the function 'f' given by $f(x) = \log \sin x$ is strictly increasing on $\left(0, \dfrac{\pi}{2}\right)$

15. Form the differential equation of the family of circles touching the y-axis at origin.

16. Find gof and fog if :

$$f(x) = |x| \text{ and } g(x) = (5x - 2)$$

17. Prove that $\tan^{-1} \dfrac{2}{11} + \tan^{-1} \dfrac{7}{24} = \tan^{-1} \dfrac{1}{2}$.

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18. Express $\tan^{-1} \left(\dfrac{\cos x}{1 - \sin x} \right)$, $-\dfrac{\pi}{2} < x < \dfrac{\pi}{2}$ in the simplest form.

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19. By using properties of determinants, show that :

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)$$

20. Differentiate $x^{\sin x} + (\sin x)^{\cos x}$ w.r.t.x.

21. $y = 5\cos x - 3\sin x$, prove that $\dfrac{d^2y}{dx^2} + y = 0$

22. Evaluate $\displaystyle\int \dfrac{5x}{x+1(x^2+9)}dx$

23. Evaluate $\displaystyle\int_0^4 |x - 1| dx$.

24. Evlauate $\displaystyle\int (x + 1)\sqrt{2x^2 + 3}dx$

25. Solve: $x^2 \dfrac{dy}{dx} = x^2 - 2y^2 + xy$

26. I.F. of $x\dfrac{dy}{dx} + y = x\log x$ is ....

27. Find λ if the vectors

$\hat{i} - \hat{j} + \hat{k}, 3\hat{i} + \hat{j} + 2\hat{k}$ and $\lambda\hat{j} - 3\hat{k}$ are coplanar

28. Find the equation of the plane through the intersection of the planes $3x - y + 2z - 4 = 0$ and $x + y + z - 2 = 0$ and the point $(2, 2, 1)$.I

29. One card is drawn at random from a well shuffled deck of 52 cards. If E is the even "the card drawn is back"." F is the event " the card drawn is King, Are E and F independent ?

30. From a lot of 30 bulbs which include 6 defectives, a sample of 4 bulbs is drawn at random with replacement. Find the probability distribution of the number of defective bulbs.

31. Let E and F be events with $P(E) = \dfrac{3}{5}$, $P(F) = \dfrac{3}{10}$ and $P(E \cap F) = \dfrac{1}{5}$. Are E and F independent?

32. Solve the following system of linear equations by matrix method :

$x - y + 2z = 7, \, 3x + 4y - 5z = -5, \, 2x - y + 3z = 12$

33. A man of height $2m$ walks at a uniform speed of $5k\dfrac{m}{h}$ away from a lamp post which is $6m$ high. Find the rate at which the length of his shadow increases.

34. Find the equation of the tangent line to the curve $y = x^2 - 2x + 7$, which is parallel to the line $2x - y + 9 = 0$.

35. Find the area of smaller region bounded by the ellipse $\dfrac{x^2}{9} + \dfrac{y^2}{4} = 1$ and straight line $\dfrac{x}{3} + \dfrac{y}{2} = 1$.

36. Using integration find the area of regeion bounded by the triangle whose vertices are (-1,0), (1,3) and (3,2)

37. Find the shortest distance between the lines given by

$$\vec{r} = 3\hat{i} + 8\hat{j} + 3\hat{k} + \lambda\left(3\hat{i} - \hat{j} + \hat{k}\right) \text{ and}$$

$$\vec{r} = -3\hat{i} - 7\hat{j} + 6\hat{k} + \mu\left(-3\hat{i} + 2\hat{j} + 4\hat{k}\right).$$

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38. Find the co-ordinates of the point where the line through the points A(3,4,1) and B(5,1,6) crosses the xy-plane.

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39. Solve the following linear programming problem graphically:

Maximise Z = 4x+y subject to the constraints :

$$x + y \leq 50$$

$$3x + y \leq 90$$

$$x \geq 0, y \geq 0$$

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40. The principal value of $\sin^{-1}\left(\sin\dfrac{2\pi}{3}\right)$ is ....

A. $\dfrac{-2\pi}{3}$

B. $\dfrac{2\pi}{3}$

C. $\dfrac{\pi}{3}$

D. none of these

Answer:

41. If $D = \left[a_{ij}\right]_{m \times n}$ is a rectangular matrix, then

A. $m > n$

B. $m = n$

C. $m < n$

D. none of these

Answer:

42. The derivative of a^x is

   A. $a^x \log a$

   B. a^x

   C. $\dfrac{a^x}{\log a}$

   D. none of these

Answer:

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43. Find the rate of change of area of the circle with respect to its radius r when r = 5 cm is

A. $8\pi cm^2/\text{sec}$

B. $10\pi cm^2/\text{sec}$

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Answer:

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44. Evaluate : $\displaystyle\int \frac{dx}{x^2 - 6x + 13}$.

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B. $\dfrac{1}{3}\tan^{-1} \dfrac{x-3}{2} + c$

C. $\dfrac{x+3}{2} \tan^{-1} x + c$

D. $\dfrac{1}{3} \tan^{-1}(x - 3) + c$

Answer:

45. The degree of differential equation $xy\dfrac{d^2y}{dx^2} + x\left(\dfrac{dy}{dx}\right)^2 - y\dfrac{dy}{dx} = 0$ is

A. 0

B. 2

C. 1

D. none of these

Answer:

46. If $\left(\hat{i}, \hat{j}, \hat{k}\right)$ are the usual three perpendicular unit vectors, then the value of

$$\hat{i} \cdot \left(\hat{j} \times \hat{k}\right) + \hat{j} \cdot \left(\hat{i} \times \hat{k}\right) + \hat{k} \cdot \left(\hat{i} \times \hat{j}\right) \text{ is}$$

A. 0

B. -1

C. 1

D. 3

Answer:

47. The Projection of vector $\hat{i} - \hat{j}$ on vector $\hat{i} - \hat{j}$ is equal to

A. 1

B. $\dfrac{1}{\sqrt{2}}$

C. 0

D. none of these

Answer:

48. Direction casines of z-axis are

A. (0,0,1)

B. (1,0,0)

C. (0,0,0)

D. (0,1,0)

Answer:

49. If $P(A) = \dfrac{1}{2}$, $P(B) = 0$ then $P(A \mid B)$ is :

A. 0

B. $\dfrac{1}{2}$

C. not defined

D. 1

Answer:

50. If $A = \begin{bmatrix} -1 & 2 & 3 \\ 5 & 7 & 9 \\ -2 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & 1 & -5 \\ 1 & 2 & 0 \\ 1 & 3 & 1 \end{bmatrix}$,

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defined by

$$f(x) \begin{cases} 3 & \text{if } 0 \le x \le 1 \\ 4 & \text{if } 1 < x < 3 \\ 5 & \text{if } 3 \le x \le 10 \end{cases}$$

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56. Prove that $\tan^{-1}\dfrac{2}{11} + \tan^{-1}\dfrac{7}{24} = \tan^{-1}\dfrac{1}{2}$.

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57. Express $\tan^{-1}\left[\dfrac{\cos x}{1 - \sin x}\right] x - \dfrac{\pi}{2} < x < \dfrac{\pi}{2}$ in simples form

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58. using properties of determinates, prove that :

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)$$

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61. Evaluate $\displaystyle\int \dfrac{5x}{x+1(x^2+9)}dx$

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64. Solve: $x^2 \dfrac{dy}{dx} = x^2 - 2y^2 + xy$

65. $x\dfrac{dy}{dx} + 2y = x^2 \log x$

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$\overrightarrow{r} = \hat{i} + 2\hat{j} + 3\hat{k}) \lambda (\hat{i} - 3\hat{j} + 2\hat{k})$ and

$\overrightarrow{r} = \left(4\hat{i} + 5\hat{j} + 6\hat{k}\right) + \mu\left(2\hat{i} + 3\hat{j} + \hat{k}\right)$

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