MATHS

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MODEL QUESTION PAPER - II

Part I

1. If the matrix $\begin{bmatrix} -1 & 1 & 1 \\ 3 & k & 4 \\ 2 & -3 & 5 \end{bmatrix}$ has an inverse then the value of k.

A. k is any real number

B. $k = -4$

C. $k \neq -4$

D. $k \neq 4$

Answer:

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2. The inverse of $\begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$ is :

A. $\begin{pmatrix} 2 & -1 \\ -5 & 3 \end{pmatrix}$

B. $\begin{pmatrix} -2 & 1 \\ 5 & -3 \end{pmatrix}$

C. $\begin{pmatrix} 3 & -5 \\ -1 & -3 \end{pmatrix}$

D. $\begin{pmatrix} -3 & 1 \\ 5 & -2 \end{pmatrix}$

Answer:

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3. The value of $\left(\frac{-1+i\sqrt{3}}{2}\right)^{100} + \left(\frac{-1-i\sqrt{3}}{2}\right)^{100}$ is :

A. 2

B. 0

C. -1

D. 1

Answer:

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4. Find the value of k if $9x^2 + kx + 1 = 0$ has equal roots.

A. -9

B. 6

C. -6

D. 3

Answer:

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5. The domain of the function defined by $f(x) = \cos^{-1}\sqrt{x-1}$ is :

A. [1,2]

B. [-1,1]

C. [0,1]

D. [-1,0]

Answer:

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6. The centre of the ellipse is (4,-2) and one of the foci is (4,2) . The other focus is :

A. (4,0)

B. (8,0)

C. (4,-6)

D. (8,-6)

Answer:

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7. The line 4x+2y = c is a tangent to the parabola $y^2 = 16x$ then c is :

A. -1

B. -2

C. 4

D. -4

Answer:

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8. The value of $\left[\hat{i}-\hat{j}, \hat{j}-\hat{k}, \hat{k}-\hat{i}\right]$ is :

A. 0

B. 1

C. 2

D. 3

Answer:

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9. The unit normal vector to the plane 2x - y + 2z = 5 are .....

A. $\pm\left(2\hat{i}-\hat{j}+2\hat{k}\right)$

B. $\pm\frac{2}{3}\left(2\hat{i}-\hat{j}+2\hat{k}\right)$

C. $\pm 3\left(2\hat{i} - \hat{j} + 2\hat{k}\right)$

D. $\pm \frac{1}{3}\left(2\hat{i} - \hat{j} + 2\hat{k}\right)$

Answer:

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10. The value of c is Rolle's theoram for the function f(x) = $\cos\left(\frac{x}{2}\right)$ on $[\pi, 3\pi]$ is:

A. 0

B. 2π

C. $\frac{\pi}{2}$

D. $\frac{3\pi}{2}$

Answer:

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11. The point of inflexion for the curve $y = x^3 - 3x + 1$ is :

A. (0,1)

B. (1,0)

C. (1,1)

D. (0,0)

Answer:

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12. If $f = \frac{x+y}{\sqrt{x-y}}$ then $x\frac{\partial f}{\partial x} + y\frac{\partial f}{\partial y}$ is :

A. $-2f$

B. $\frac{f}{2}$

C. $2f$

D. $\frac{-f}{2}$

Answer:

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13. $\int_0^{\frac{\pi}{2}} e^{-x} \sin x \, dx$ is

A. $1 + e^{\frac{-\pi}{2}}$

B. $\frac{1 + e^{\frac{-\pi}{2}}}{2}$

C. $1 - e^{\frac{-\pi}{2}}$

D. $\frac{1 - e^{\frac{-\pi}{2}}}{2}$

Answer:

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14. The volume of the solid that results when the region enclosed by $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is revolved about the minor axis is :

A. $\frac{1}{2}\pi ab^2$

B. $\frac{4}{3}\pi a^2 b$

C. $\frac{4}{3}\pi ab^2$

D. $\frac{3}{4}\pi a^2 b$

Answer:

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15. Find the order and degree of the differential equation $\frac{d^3y}{dx^3} = \sqrt[3]{1 + \frac{d^3y}{dx^3}}$

A. (3,3)

B. (2,2)

C. (3,2)

D. (2,3)

Answer:

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16. The integrating factor of $\frac{dy}{dx} + \frac{1}{x \log x} y = \frac{2}{x^2}$ is :

A. e^x

B. $\log x$

C. $\frac{1}{x}$

D. e^{-x}

Answer:

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17. $p \Leftrightarrow q$ is equivalent to :

A. $p \rightarrow q$

B. $q \rightarrow p$

C. $(p \rightarrow q) \vee (q \rightarrow p)$

D. $(p \rightarrow q) \wedge (q \rightarrow p)$

Answer:

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18. Which of the following is a tautology ?

A. $p \vee q$

B. $p \wedge q$

C. $p \vee \neg q$

D. $p \vee \neg p$

Answer:

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Part Ii

1. Solve by matrix method : 2x+3y = 5, 3x-y = 2.

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2. Find the modulus and amplitude of $\frac{1}{1+i\sqrt{3}}$

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3. Find the value of $\sin\left(\frac{\pi}{3} + \cos^{-1}(-1)\right)$

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4. Find the shortest distance from the point (2, 10, 1) to the plane $\vec{r}\left(3\hat{i} - \hat{j} + 4\hat{k}\right) = 2\sqrt{26}$

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5. Find the axis and focus of the parabola $y^2 - 2y + 8x - 23 = 0.$

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6. Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.

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7. Evaluate $\int_0^3 \frac{\sqrt{x}dx}{\sqrt{x} + \sqrt{3-x}}$

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8. Derive the formula for the volume of right circular cone with radius r and height h.

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9. Solve $\frac{dy}{dx} = \frac{1+y}{1-x}$.

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10. The mean and variance of a binomial variate is 4 and $\frac{4}{3}$ in 6 trials. Find P(X= 2).

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Part Iii

1. Find the adjoint of the matrix A = $\begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$ and verify that A(adj A) = (Adj A)A = |A| I

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2. If $z = x + iy$find the locus of z if $|2z + 1| = 2.$

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3. If x = 1 is one root of the equation $x^3 - 6x^2 + 11x - 6 = 0,$ find the other roots.

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4. If a parabolic reflector is 20 cm in diameter and 5 cm deep, then its focus is

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5. The foot of the perpendicular drawn from the origin in a plane is (8, -4, -3) . Find the equation of the plane.

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6. Evaluate $\lim_{x \to 0} \left(\operatorname{cosec} x - \frac{1}{x} \right)$.

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7. Verify Lagrange 's law of the mean for f(x) = x^3 on [-2, 2].

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8. Evaluate: $\int_{\pi/6}^{\pi/3} \frac{dx}{1 + \sqrt{\cot x}}$

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9. Form the differential equation from $y = Ae^{3x} + Be^{-2x}$.

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10. If f(x) = $\frac{A}{x}, 1 < x < e^3$ is a probability density function of a continuous randdom variable X find A and P$(X > e)$.

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Part Iv

1. If $arg(z-1)=\frac{\pi}{6}$ and $arg(z+1)=2\frac{\pi}{3}$, then prove that $|z|=1$.

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2. Solve $x^4+2x^2-4x+8=0$ given that (1+i) is a root. Find other roots.

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3. Show that $\tan^{-1} x = x - \frac{x^3}{3} + \frac{x^5}{5} \ldots\ldots$ using Maclaurin's series expansion is $|x| < 1$.

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4. Find the area between the curves $y^2 = 4ax$ and $x^2 = 4ay$.

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5. If $u = \tan^{-1}\left(\frac{x}{y}\right)$ show that $\frac{\partial^2 u}{\partial x\, \partial y} = \frac{\partial^2 u}{\partial y\, \partial x}$.

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6. Show that $[\neg p \vee \neg q] \vee p$ is a tautology.

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7. Show that $[\neg q \wedge p] \wedge q$ is a contradiction.

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8. Find the equations of the two tangents that can be drawn from (5,2) to the ellispse $2x^2 + 7y^2 = 14$

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