MATHS

BOOKS - OMEGA PUBLICATION

HP BOARD MARCH 2017

Series A

1. Principal value of `cos^-1 (-1/2) is :

A. $\frac{\pi}{3}$

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

C. $-\frac{\pi}{3}$

D. $\frac{\pi}{6}$

Answer:

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2. If the matrix A is both symmetric and skew symmetric, then :

A. A is a diagonal matrix

B. A is zero matrix

C. A is a square matrix

D. None of the above

Answer:

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3. The deriavative of $\sin 30^\circ$ is

A. $\frac{1}{2}$

B. $\cos 30^\circ$

C. $-\cos 30^\circ$

D. 0

Answer:

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4. Find the approximate change in the volume V of a cube of side 'x' metres caused by increasng the side by 2%.

A. $0.06x^3m^3$

B. $0.002x^3m^3$

C. $0.6x^3m^3$

D. $0.006x^3nt^3$

Answer:

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5. An antiderivative of sin 2x is

A. $\cos 2x$

B. $-\cos 2x$

C. $-\dfrac{\cos 2x}{2}$

D. $2\cos 2x$

Answer:

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6. The order of the differential equation:

$2x^2\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + y = 0$ is:

A. 1

B. 2

C. 3

D. Cannot be defined.

Answer:

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7. Find the projection of the vector $\hat{i} - \hat{j}$ on the vector $\hat{i} + \hat{j}$.

A. 0

B. -1

C. $\frac{1}{\sqrt{2}}$

D. None of the above

Answer:

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8. If the angle between two vector $\vec{a}$ and $\vec{b}$ is zero then

A. $\vec{a} . \vec{b} = \left|\vec{a}\right|\left|\vec{b}\right|$

B. $\vec{a} . \vec{b} = 0$

C. $\left|\vec{a}\right|\left|\vec{b}\right| = 1$

D. None of the above

Answer:

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9. Find the distance of the plane 3x-4y+12z=3 from the origin.

A. $\frac{3}{13}$

B. $\frac{13}{3}$

C. -2

D. 3

Answer:

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10. If $P\left(\frac{A}{B}\right) > P(A)$, then which of the following is correct : :

A. $P(B/A) < P(B)$

B. $P(A \cap B) < P(A).P(B)$

C. $P(B/A) > P(B)$

D. $P(B/A) = P(B)$

Answer:

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11. Using elementary transformation, find the inverse of the matrix $A = \begin{bmatrix} 3 & -1 \\ -4 & 2 \end{bmatrix}$

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12. If $A = \begin{bmatrix} 8 & 0 \\ 4 & -2 \\ 3 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -2 \\ 4 & 2 \\ -5 & 6 \end{bmatrix}$ then find the matrix X such that $2A + 3X = 5B$

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13. Find the relationship between a and b so that the function f defined by

$$f(x) = \begin{cases} ax + 1 & \text{if} \quad x \leq 3 \\ bx + c & \text{If} \quad x > 3 \end{cases}$$

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15. Form the differential equation representing the family of curve $y = a\sin(x + b)$, where a and b are artibrary constants.

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16. Let L be the set of all lines in XY plane and R be the relation in L defined as $R = \{(L_1, L_2), L_1$ is parallel to $L_2\}$. Show that R is an equilavence relation.

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17. Show that $\cos^{-1}\frac{4}{5}+\cos^{-1}\frac{12}{13}=\cos^{-1}\frac{33}{65}$

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

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19. Using the propertis of derminants, prove tha

$$\begin{vmatrix} x+4 & 2x & 2x \\ 2x & x+4 & 2x \\ 2x & 2x & x+4 \end{vmatrix}=(5x+4)(4-x)^2$$

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20. Find $\frac{dy}{dx}$, if $\sin^2 x + \cos^2 y = 1$

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21. If $y = Ae^{mx} + Be^{nx}$, Show that $\left(\frac{d^2}{dx^2}y\right) - (m+n)\frac{dy}{dx} + mny = 0$

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27. Show that the four points A,B,C and D with position vectors $4\hat{i} + 5\hat{j} + \hat{k}$, $-\left(\hat{j} + \hat{k}\right)$, $\left(3\hat{i} + 9\hat{j} + 4\hat{k}\right)$ and $4\left(-\hat{i} + \hat{j} + \hat{k}\right)$ respectively are coplanar.

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Series B

1. The principal value of $\cos^{-1}\frac{\sqrt{3}}{2}$ is

A. $\frac{\pi}{6}$

B. $\frac{\pi}{3}$

C. $-\frac{\pi}{6}$

D. $\frac{\pi}{4}$

Answer:

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2. If A and B are invertible matrices , then:

A. BA

B. $B^{-1}A$

C. BA^{-1}

D. $B^{-1}A^{-1}$

Answer:

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Answer:

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Answer:

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7. The projection of the vector $2\hat{i} + 3\hat{j} + 2\hat{k}$ on the vector $\hat{i} + 2\hat{j} + \hat{k}$

A. $\frac{5\sqrt{6}}{3}$

B. $\frac{6\sqrt{5}}{3}$

C. $\frac{8\sqrt{5}}{3}$

D. 0

Answer:

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8. The dot product of the two vectors $\vec{a}$ and $\vec{b}$ is

A. $\left|\vec{a}\right|\left|\vec{b}\right|\cos\theta$

B. $\left|\vec{a}\right| = \left|\vec{b}\right|\cos\theta$

C. $\left|\vec{b}\right| = \left|\vec{a}\right|\cos\theta$

D. None of the above

Answer:

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9. The distance of the plane $x + 2y - 2z = 9$ from the point (2,3,-5) is

A. 3

B. 4

C. 0

D. 5

Answer:

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10. If A and B are two events such that $P(A) \neq 0$ and $P\left(\frac{B}{A}\right) = 1$, then

A. $A \subset B$

B. $B \subset A$

C. $B = \phi$

D. $A = \phi$

Answer:

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12. Find X and Y if $X + Y = \begin{bmatrix} 5 & 2 \\ 0 & 9 \end{bmatrix}$ and $X = Y = \begin{bmatrix} 3 & 6 \\ 0 & -1 \end{bmatrix}$

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13. Find the values of a and b such that the function defined by

$$f(x)\begin{cases} 5 & \text{if } x \geq 2 \\ ax+b & \text{if } 2 < x < 10 \\ 21 & \text{if } x \geq 10 \end{cases}$$ is continuous.

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14. Find the intervals in which the function f, given by $f(x) = -2x^3 - 9x^2 - 12x + 1$ is strictly increasing and strictly decreasing.

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15. Form the differential equation representing the family of curves $\frac{x}{a}+\frac{y}{b}=1$ where a and b are arbitrary constants.

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16. Show that the relation R defined in the set A of all triangles as $R=\{(T_1,T_2):T_1 \text{ is similar to } T_2\}$ is an equivalence relation.

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17. Show that $\sin^{-1}\frac{8}{17}+\sin^{-1}\frac{3}{5}=\tan^{-1}\frac{77}{36}$

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18. Express $\tan^{-1}\frac{x}{\sqrt{a^2-x^2}}, |x|<a$ in the simples form

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19. Using the properties of determinats, show that

$$\begin{vmatrix} y+k & y & y \\ y & y+k & y \\ y & y & y+k \end{vmatrix} = k^2(3y+k)$$

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20. Find $\frac{dy}{dx}$ if $\sin^2 y + \cos xy = \pi$

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21. If $= 3e^{2x} + 2e^{3x}$ then prove that $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$

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

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23. Evaluate $\int \frac{xe^x}{(1+x)^2} dx$

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24. Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$

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25. Solve differential equation

$\frac{dy}{dx} + \sec xy = \tan x \left(0 \leq x \leq \frac{\pi}{2}\right)$

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26. Solve the differential equation $y \log y dx - x dy = 0$

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27. Show that the points A(3,2,1),B(4,5,5),C(4,2,-2) and D(6,5,-1) are coplanar.

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28. Find the angle between the pair of lines

$\vec{r} = 2\hat{i} - 5\hat{j} + \hat{k} + \lambda\left(3\hat{i} + 2\hat{j} + 6\hat{k}\right)$ and

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

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29. Assume that each child born is equally likely to be a boy or a girl. If a family has two children, what is the conditional probability that both are girls? Given that (i) the youngest is a girl, (ii) at least one is a girl.

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30. Find the probabiltiy distribution of number of tails in the simultaneous tosses of three coins.

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31. A and B throw a die alternatively till one of them gets a '6' and wins the game. Find their respective probabilities of winning, if A starts first.

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

$x - y + z = 4, 2x + y - 3z = 0, x + y + z = 2$

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33. Find the equations of the tangent and normal to the parabola $y^2 = 4ax$ at the point $\left(at^2, 2at\right)$.

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34. Find two positive numbers x and y such that their sum is 35 and product x^2y^5 is maximum.

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35. Find the area of the region bounded by $x^2 = 4y, y = 2, y = 4$ and y-axis the first quadrant.

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36. Find the area of the region bounded by two parabolas $y = x^2$ and $y^2 = x$.

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37. Find the distance between the lines l_1 and l_2 given by : $\vec{r} = \hat{i} + 2\hat{j} - 4\hat{k} + \lambda\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right)$ and $\vec{r} = 3\hat{i} + 3\hat{j} - 5\hat{k} + \mu\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right)C\tilde{O}$

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59. Find $\frac{dy}{dx}$ if $\sin^2 y + \cos xy = \pi$

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60. If $= 3e^{2x} + 2e^{3x}$ then prove that $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$

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

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62. Evaluate $\int \frac{xe^x}{(1+x)^2}dx$

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63. Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}} dx$

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64. Solve differential equation $\frac{dy}{dx} + \sec xy = \tan x \left(0 \leq x \leq \frac{\pi}{2}\right)$

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65. Solve the differential equation

$y \log y dx - x dy = 0$

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66. Show that the points A(3,2,1),B(4,5,5),C(4,2,-2) and D(6,5,-1) are coplanar.

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67. Find the angle between the pair of lines

$\vec{r} = 2\hat{i} - 5\hat{j} + \hat{k} + \lambda\left(3\hat{i} + 2\hat{j} + 6\hat{k}\right)$ and

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

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68. Assume that each child born is equally likely to be a boy or a girl. If a family has two children, what is the conditional probability that both are girls? Given that (i) the youngest is a girl, (ii) at least one is a girl.

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69. Find the probabiltiy distribution of number of tails in the simultaneous tosses of three coins.

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70. A and B throw a die alternatively till one of them gets a '6' and wins the game. Find their respective probabilities of winning, if A starts first.

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71. Solve the following system of equations using matrix method:

$x - y + 2z = 1$

$2y - 3z = 1$

$3x - 2y + 4z = 2$

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72. Find the equations of the tangent and normal to the parabola $y^2 = 4ax$ at the point $\left(at^2, 2at\right)$.

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73. Find two positive numbers x and y such that their sum is 35 and product x^2y^5 is maximum.

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74. Find the area of the region bounded by $x^2 = 4y, y = 2, y = 4$ and y-axis the first quadrant.

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75. Find the area of the region bounded by two parabolas $y = x^2$ and $y^2 = x$.

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76. Find the distance between the lines l_1 and l_2 given by : $\vec{r} = \hat{i} + 2\hat{j} - 4\hat{k} + \lambda\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right)$ and $\vec{r} = 3\hat{i} + 3\hat{j} - 5\hat{k} + \mu\left(2\hat{i} + 3\hat{j} + 6\hat{k}\right) C\tilde{O}$

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77. Find the coordinates 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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78. Solve the following linear programming problem graphically:

Miximise $Z = 5x + 3y$ subject to the constraints :

$3x + 5y \leq 15$

$5x + 2y \leq 10$

$x \geq 0, y \geq 0$

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Series C

1. The principal value of $\cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$ is ..... .

A. $\frac{3\pi}{4}$

B. $\frac{\pi}{4}$

C. $-\frac{\pi}{4}$

D. $\frac{5\pi}{4}$

Answer:

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2. If A and B are symmetric matrices of same order then $AB - BA$ is a :

A. skew symmetric matrix

B. symmetric matrix

C. zero matrix

D. identity matrix

Answer:

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3. The drivateive of $\tan 45^\circ$ is

A. 1

B. $\cot 45^\circ$

C. $-\cot 45^\circ$

D. 0

Answer:

Watch Video Solution

4. Find the approximate change in the volume V of a cube of side x metres caused by increasing the side by 1%.

A. $0.03x^3m^3$

B. $0.3x^3m^3$

C. $0.003x^3m^3$

D. $0.001x^3m^3$

Answer:

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5. An antiderivative of sin mx is

A. $-\frac{\cos mx}{m}$

B. $-\cos mx$

C. $-m\cos mx$

D. cosmx

Answer:

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6. The degree of the differential equation $\frac{d^3y}{dx^3}+2\left(\frac{d^2y}{dx^2}\right)^2-\frac{dy}{dx}+y=0$ is

A. 1

B. 2

C. 3

D. Cannot be defined.

Answer:

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7. Find the projection of the vector $\hat{i} + 3\hat{j} + 7\hat{k}$ on the vector $7\hat{i} - \hat{j} + 8\hat{k}$.

A. $\frac{60}{\sqrt{114}}$

B. $\frac{60}{114}$

C. $\frac{66}{\sqrt{114}}$

D. None of the above

Answer:

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8. The dot product of the two vectors $\vec{a}$ and $\vec{b}$ is

A. $\left|\vec{a}\right|\left|\vec{b}\right|\sin\theta\hat{n}$

B. $\left|\vec{a}\right| = \left|\vec{b}\right|\sin\theta\hat{n}$

C. $\left|\vec{a}\right| = \left|\vec{b}\right|\tan\theta\hat{n}$

D. None of the above

Answer:

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9. The distance of the plane $2x - y + 2z + 3 = 0$ from the point (3,2,1) is

A. $\frac{3}{13}$

B. $\frac{13}{3}$

C. 0

D. 13

Answer:

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10. If A and b are any two events such that $P(A) + P(B) - P(A \text{and} B) = P(A)$, then

A. $P(B/A) = 1$

B. $P(A/B) = 1$

C. $P(B/A) = 0$

D. $P(A/B) = 0$

Answer:

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11. By using elementary transformation find the inverse of the matrix : $A = \begin{bmatrix} 2 & -3 \\ -1 & 2 \end{bmatrix}$

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12. Find the values of x and y from the equation $2\begin{bmatrix} x & 5 \\ y & -3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$

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13. Find the values of k so that the function f, defined by $f(x) = \begin{cases} kx + 1 & \text{if } x \leq 5 \\ 3x - 5 & \text{if } x > 5 \end{cases}$ is continuous at x=5.

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14. Find the intervals in which the function f given by $f(x) = 4x^3 - 6x^2 - 72x + 30$ is strictly increasing and strictly decreasing.

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15. Form a differential equation representing the family of curves $y^2 = a\left(b^2 - x^2\right)$ by eliminating a and b.

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16. Let T be the set of all triangles in a plane with R a relation in T given by : $R = \{(T_1, T_2) : T_1$ is congruent to T_2}. Show that R is an equivalence relation.

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17. Prove that $\cos^{-1}\frac{12}{13}+\sin^{-1}\frac{3}{5}=\sin^{-1}\frac{56}{65}$

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18. Write $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right), x\neq 0$ simplest form.

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19. Using the properties of determinants, show that

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc+bc+ca+ab$$

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20. Find $\frac{dy}{dx}$ if $xy^2 + y^2 = \tan x + y$

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21. If $y = 500e^7 x + 600e^{-7} x$ show that $\left(d^2 \frac{y}{dx^2}\right) = 49y$

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22. Evaluate $\int (x+3)\sqrt{3 - 4x - x^2} dx$

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23. Evaluate $\int e^x \left(\frac{1}{x} - \frac{1}{x^2} \right) dx.$

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

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25. Solve the differntial equation $\frac{dy}{dx} + \frac{y}{x} = x^2$

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26. Solve the differential equation $\frac{dy}{dx} = \frac{x+1}{2-y}, (y \neq 2)$

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27. Show that the four points with position vectors $4\hat{i} + 8\hat{j} + 12\hat{k}, 2\hat{i} + 4\hat{j} + 6\hat{k}, 3\hat{i} + 5\hat{j} + 4\hat{k}$ and $5\hat{i} + 8\hat{j} + 5\hat{k}$ are coplanar.

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28. Find the angle between the pair of lines $\frac{x-5}{7}=\frac{y+2}{-5}=\frac{z}{1}$ and $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$

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

$3x - 2y + 3z = 8, 2x + y - z = 1, 4x - 3y + 2z = 4$

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36. Area lying between the curve $y^2 = 4x$ and the line $y = 2x$ is :

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37. Find the shortest distance between the lines $\vec{r} = \hat{i} + 2\hat{j} + 3\hat{k} + \lambda\left(\hat{i} - 3\hat{j} + 2\hat{k}\right)$ and $\vec{r} = 4\hat{i} + 5\hat{j} + 6\hat{k} + \lambda\left(2\hat{i} + 3\hat{j} + \hat{k}\right)$

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Answer:

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