MATHS

BOOKS - UNITED BOOK HOUSE

SET 1

Exercise

1. If A = {1,2,3,4} and I_A be the identity relation on A, then

A. $(1, 2) \in I_A$

B. $(2, 2) \in I_A$

C. $(2, 1) \in I_A$

D. $(3, 4) \in I_A$,

Answer:

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2. The principal value of $\tan^{-1}\left(-\sqrt{3}\right)$ is

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

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

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

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

Answer:

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3. If A is an invertible matrix of order 3 and |A| =5, then the value of |adjA| is equal to

A. 20

B. 21

C. 24

D. 25

Answer:

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4. IF $f(x) = \log\left(\tan\left(\frac{x}{2}\right)\right)$, then the value of f'(x) is

A. sin x

B. $\frac{1}{2}\left(\sin\left(\frac{x}{2}\right)\cos\left(\frac{x}{2}\right)\right)$

C. $-\cos ecx$

D. cosec x

Answer:

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5. The value of $\int_0^{\pi} \cos|x|dx$ is

A. 0

B. 1

C. 2

D. none of these

Answer:

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6. The area (in squnit) bounded by the curve $y = \sin x$, x-axis and the two ordintes $x = \pi, x = 2\pi$ is

A. 1

B. -1

C. -2

D. 2

Answer:

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7. Angle between the straight lines $\frac{x-5}{7}=\frac{y+2}{-5}=\frac{z}{1}$ and $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ is

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

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

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

D. π

Answer:

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8. The value of m for which the straight line 3x-2y+z+3 = 0=4x-3y+4z+1. is parallel to the plane 2x-y+mz-2 = 0 is

A. -2

B. 8

C. -18

D. 11

Answer:

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9. If the odds against an event are 4:5, then the probability of occurrence of the event is0

A. $\frac{5}{9}$

B. $\frac{4}{9}$

C. $\frac{4}{5}$

D. $\frac{1}{9}$

Answer:

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10. The variance of a binomial distribution with parameters n and p is-

A. $\frac{n}{4}$

B. $\leq \frac{n}{4}$

C. $> \frac{n^2}{4}$

D. $\leq \frac{n^2}{4}$

Answer:

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11. On the set Q^+ of all positive rational numbers if the binary operation * is defined by $a*b = \frac{1}{4}ab$ for all $a, b \in Q^+$ find the identity element in Q^+.

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12. Solve: $\tan^{-1}(\cot x) + \cot^{-1}(\tan x) = \frac{\pi}{4}$

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13. Prove that $\begin{vmatrix} y+z & z & y \\ z & z+x & x \\ y & x & x+y \end{vmatrix}$ =4xyz`

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14. If $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$ and $AB = \begin{bmatrix} -13 & 8 \\ -8 & 5 \end{bmatrix}$ find B.

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15. Evaluate: $\lim_{x \to 0} \left(\frac{a^x - b^x}{x} \right)$

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16. If $x = t \log t, y = \frac{\log t}{t}$, find $\frac{dy}{dx}$ when t=1

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

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18. Solve: $\frac{dy}{dx} = 1 - x + y - xy$

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19. Show that the function $f(x) = \frac{2}{3}x^3 - 6x^2 + 20x - 5$ has neither a maximum nor a minimum value.

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20. The radius of a circular plante increased at the rate of 0.002 cm/s. How fast is the area changing when radius is 14 cm?

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21. Find the acute angle between z-axis and the straight line joining the points (3,2,3) and (-3,-1,5).

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22. Prove that the equation of the plane which passes through the point (2,-3,5) and which is parallel to the yz-plane is x= 2.

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23. Show that the probability that exactly one of the events A and B occurs is P(A) + P(B) - 2P(AB).

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24. Show that $\tan^{-1}\left(\frac{1}{\sqrt{3}}\frac{\tan x}{2}\right) = \frac{1}{2}\frac{\cos^{-1}(1+2\cos x)}{2+\cos x}$.

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25. If $A = \begin{bmatrix} 1 & x & -2 \\ 2 & 2 & 4 \\ 0 & 0 & 2 \end{bmatrix}$ and $A^2 + 2I_3 = 3A$ Find x, here I_3 is the unit matrix of order 3.

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26. Prove that . $\begin{vmatrix} 1 & a & a^2-bc \\ 1 & b & b^2-ca \\ 1 & c & c^2-ab \end{vmatrix} = 0$

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27. Show that , $\begin{vmatrix} \frac{a^2+b^2}{c} & c & c \\ a & \frac{b^2+c^2}{a} & a \\ b & b & \frac{c^2+a^2}{b} \end{vmatrix} = 4abc$

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28. If $f(x) = \tan^{-1}\left(\frac{x}{1+20x^2}\right)$ show that $f'(x) = \frac{5}{1+25x^2} - \frac{4}{1+16x^2}$.

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29. Let $y = \left(\sin^{-1}x\right)^2 + \left(\cos^{-1}x\right)^2$ show that $\left(1-x^2\right)\frac{d^2y}{dx^2} - x\frac{dy}{dx} = 4$

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30. Evaluate: $\int \frac{dx}{\sqrt{\frac{2}{3}x^3 - x^2 + \frac{1}{3}}}$

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31. Solve: (6x+9y-7)dx= (2x+3y-6)dy

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32. Solve: $\left(1 - x^2\right)\frac{dy}{dx} - xy = x^2$, given y = 2 when x= 0.

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33. If $\overrightarrow{AB} = 2\hat{i} - 4\hat{j} + 5\hat{k}$ and $\overrightarrow{BC} = \hat{i} - 2\hat{j} - 3\hat{k}$ in parallogram ABCD find a unit vector in direction parallel to the diagonal $\overrightarrow{AC}$ of the parallelogram.

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34. Find x such that the four points A(3,2,1),B(4,x,5),C(4,2,-2) and D(6,5,-1) are coplaner.

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35. Prove that $\int_0^{\pi/2} \log(\sin x)dx = -\frac{\pi}{2}\log 2$

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36. Urn A contains 1 white, 2 black and 3 red balls urn B contains 2 white, 1 black and 1 red ball and urn C contains 4 white, 5 black and 3 red balls. One urn is chosen at random and two balls are drawn. These happen to be one white and one red. What is the probability that they come from urnA?

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37. A cylindrical tin can, open at the top, of a given capacity has to be constructed, show that the amount of the tin required will be least if the height of the can is equal to its radius.

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38. If the straight line y =kx+3 is a tangent to the hyperbola $7x^2 - 4y^2 = 28$, find K

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39. Using calculus, find the area bounded by the curve |x|+|y|=1.

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40. Show that the lines $\vec{r} = \left(\hat{i} + \hat{j} + \hat{k}\right) + t\left(\hat{i} - \hat{j} + \hat{k}\right)$ and $\vec{r} = \left(3\hat{i} - \hat{k}\right) + s\left(4\hat{j} - 16\hat{k}\right)$ intersect and find the position vector of their point of their point of intersection.

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41. Find the equation of the plane passing through the points (-1,1,1) and (1,-1,1) and is perpendicular to the plane x+2y+2z = 5.`

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42. The value of $\sin^{-1}\cos 150^\circ$ is.....

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

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

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

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

Answer:

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43. If a square matrix A is equal to its transpose A^T, then A^T is called a

A. symmetric

B. identify

C. skew symmetric

D. none of these.

Answer:

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44. The points of discontiuties of the funtion $f(x) = \frac{x+2}{2x^2 - x - 1}$ are:

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

B. $-\frac{1}{2}, -1$

C. $1, -\frac{1}{2}$

D. $\frac{1}{2}, 1$

Answer:

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45. The value of $\int e^{-\frac{1}{x}} \frac{.1}{x^2} dx$ is.....

A. $\frac{1}{x} e^{-\frac{1}{x}} + c$

B. $-\frac{1}{x} e^{-\frac{1}{x}} + c$

C. $e^{-\frac{1}{x}} + c$

D. $-e^{-\frac{1}{x}} + c.$

Answer:

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46. The value of p for which the vectors $p\hat{i} - 5\hat{j}$ and $2\hat{i} - 3\hat{j}$are collinear is

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

B. $\frac{10}{3}$

C. 10

D. 1

Answer:

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47. The angle between the lines whose direction ratios are proportional to 1, -2, 1 and 4, 3, 2 is.....

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

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

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

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

Answer:

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48. An unbiased coin is tossed three times in succession, then the probability of getting exactly one head is

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

B. $\frac{5}{8}$

C. $\frac{3}{4}$

D. $\frac{3}{8}$

Answer:

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49. The probability density function of a random variable X is f(x) = $k(x-1)^2, 1 \leq x \leq 2$. The value of the constant K is

A. 3

B. 4

C. 5

D. 6

Answer:

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50. Solve:$\sin^{-1}\cos\left(\sin^{-1}x\right) = \frac{\pi}{3}$.

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51. If A = $\begin{bmatrix} 4 & 5 \\ 5 & 6 \end{bmatrix}$, show that $A^2 = 10A + I$ where I is the unit matrix of order 2.

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52. Prove that, $\lim_{x \to 0} \frac{\log \cos x}{\sin^2 x} = -\frac{1}{2}$

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53. If y = $\tan^{-1}(\sec x + \tan x)$, find $\frac{d^2y}{dx^2}$.

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54. Prove that, $\int_a^b f(a+b-x)dx = \int_a^b f(x)dx$

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55. Solve: $2^{x-y}dx + 2^{y-x}dy = 0$

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56. If $x > \frac{1}{2}$, show that the function f(x) = $x\left(4x^2 - 3\right)$ is steadily increasing.

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57. Find the area in the fourth quadrant bounded by the curve $y = x^3 - 8$ and the coordinate axes.

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58. Can the numbers 1,2,3 be the direction ratio of a straight line? Give reason.

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59. Find the intercept form of a plane with intercepts 2,3 and 4 on the x,y and z-axis respectively.

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60. A and B are two independent events with P(A) = $\frac{2}{5}$ and P(B) = $\frac{1}{3}$, evaluate$P(A \cup B)$.

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61. The mean and variance of a binomial distribution are 4 and 3 respectively. Find the values of its parameters.

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62. If $\tan^{-1} x$, $\tan^{-1} y$ and $\tan^{-1} z$ are in A.P, find the algebric relation between x,y and z. If x,y,z be also in A.P. then show that $x = y = z(y \neq 0)$.

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63. Prove that, the inverse of a given square matrix, if its exists, is unique.

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64. Prove that, $\begin{vmatrix} 2a & a-b-c & 2a \\ 2b & 2b & b-c-a \\ c-a-b & 2c & 2c \end{vmatrix} = (a+b+c)^3$

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65. If $\sqrt{1-x^2} + \sqrt{1-y^2}$ = a(x-y), show that, $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$

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66. Evaluate:

$$\int \frac{x\,dx}{(x^2-a^2)(b^2-x^2)} (b^2 > a^2).$$

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67. Evaluate:

$$\int \frac{\sqrt{x}dx}{\sqrt{a^3 - x^3}}$$

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68. Solve: $\frac{dy}{dx} - \frac{y}{x} + \cos ec\left(\frac{y}{x}\right)$=0, given y = 0 when x = 1

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69. Solve: $y^2 + \left(x - \frac{1}{y}\right)\frac{dy}{dx}$ = 0.

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70. The position vectors of the points A and B are $2\vec{a} + \vec{b}$ and $\vec{a} - 3\vec{b}$.

If the point C divides the line segment $\overline{AB}$ externally in the ratio $1:2$,

then find the position vector of the point C. Show also that A is the midpoint of the line segment $\overline{CB}$.

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71. Evaluate: $\int_0^{\pi} |\sin x + \cos x| dx$

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72. evaluate $\int_0^1 e^{-x} dx$

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73. A packet, of 10 electronic components is known to include 3 defectives. If 4 componenets are randomly chosen and tested, what is the probability of finding not more than one defective in the packet?

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74. A random variable x follows binomial distribution with mean 3 and standard deviation $\sqrt{2}$ Find the value of P(x = 2) and $P(x \leq 1)$.

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75. (b)answer any two questions : (i) a circular ink blot grows at the rate of $2c\frac{m^2}{\sec}$ .find the rate at which the radius is increasing after $2\left(\frac{6}{11}\right)\sec onds$

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76. answer any two questions :(iii) if the straight line lx+my=n be a normal to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, then by the application of calculus prove that $\frac{a^2}{l^2} - \frac{b^2}{m^2} = \frac{\left(a^2 + b^2\right)^2}{n^2}$.

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77. Find the vector equation of a line which passes throught the point with position vector $\hat{i} - 2\hat{j} + 4\hat{k}$ and is in the direction of $\hat{i} + 2\hat{j} - \hat{k}$. Also reduce it to cartesian form.

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78. Let $\vec{n}$ be a vector of magnitude $2\sqrt{3}$ such that it makes equal acute angles with the coordinate axes. Find the vectore and cartesian forms of the equation of a plane passing throught (1,-1,2) and normal to $\vec{n}$.

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79. Let Z be the set of integers and the mapping $f: Z \to Z$ be defined by, $f(x): x^2$. State which of the following is equal to $f^{-1}(-4)$?

A. {2}

B. {-2}

C. {2,-1}

D. ϕ

Answer:

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80. Solve: $\sin^{-1} x - \cos^{-1} x = \frac{\pi}{6}$

A. 1

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

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

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

Answer:

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81. Martices A and B will be inverse of each other only if

A. $AB = BA \neq 1$

B. $AB = BA = 0$

C. $AB = 0, BA = 1$

D. $AB = BA = 1.$

Answer:

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82. If $y = \log_{10} x$, then $\frac{dy}{dx}$ is equal to

A. $\frac{1}{x}\log_{10}^{e}$

B. $\frac{1}{x}\log_{e}^{10}$

C. $\frac{1}{x}\log_{10}^{e}$

D. $\frac{1}{10}x$

Answer:

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83. If $\int_a^b f(x)dx = \int_a^b \phi(x)dx$, then

A. $f(x) = \phi(x)$

B. $f(x) - \phi(x) = c$

C. $f(x) + \phi(x) = c$

D. none of these

Answer:

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84. In a given interval a function

A. can have two consecutive maxima

B. can have two consecutive minima

C. possesses maximum and minimum values alternately

D. cannot have more than two extreme values

Answer:

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85. If $\overrightarrow{OA} = \hat{i} - 2\hat{k}$ and $\overrightarrow{OB} = 3\hat{i} - 2\hat{j}$ then the direction cosines of the vectore $\overrightarrow{AB}$ are

A. $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}$

B. 2,2,2

C. $\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}$

D. $-\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}$

Answer:

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86. CHOOSE the correct answer from the following alternative : $P(A) = \frac{3}{7}, P(B) = \frac{4}{7}$ and $P(A \cap B) = \frac{2}{9}$, then the value of P(A/B) is equal to-

A. $\frac{7}{18}$

B. $\frac{14}{21}$

C. $\frac{5}{18}$

D. $\frac{4}{9}$

Answer:

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87. If X follows a binomial distribution with parameter n = 101 and $p = \frac{1}{3}$ then P(x=r) is maximum if r equal to

A. 34

B. 30

C. 32

D. 31

Answer:

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88. Prove that, $\{\cos(\sin^{-1} x)\}^2 = \{\sin(\cos^{-1} x)\}^2$.

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89. Find the real values of K for which the following system of linear equations has non-trival solutions:

x-ky+z = 0, kx + 3y - kz = 0, 3x + y-z = 0`

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90. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ then prove that, AA'=I. Hence find A^{-1}.

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91. Examine whether f(x) = $|x|$ has a derivative at x = 0.

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92. State Lagrange's mean value theorem.

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93. Evaluate: $\int \frac{\sin x dx}{\cos 2x}$

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94. Find the integrating factor of the differential equation $(x+y+1)\frac{dy}{dx}$=1.

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95. Prove that the function $\frac{\sin(x+\alpha)}{\sin(x+\beta)}$ has neither a maximum nor a minimum value.

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96. Using the method of differentail find the approximate value of $\sqrt{0.24}$.

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97. A variable plane moves in such a way that the sum of the reciprocals of its intercepts on the three coordinate axes is constant. Prove that the plane passes through a fixed point.

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98. If A and B are two independent events, prove that A^C and B are also independent events.

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99. Five cards are drawn successively with replacement from a well-shuffled deck of 52 cards. What is the probability that all the five cards are spades?

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100. If $\sin(\alpha+\beta)=\frac{4}{5}$ and $\sin(\alpha-\beta)=\frac{5}{13}$, find the value of $\tan 2\alpha$.

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101. If A and B are tow matrices such that AB =O, can we deduce that either A or B is a zero matrix ? Illustrate by an example.

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102. $(AB)^{-1} = B^{-1}A^{-1}$ where A and B are invertible matrices satisfying commutative property with respect to multiplication. Write true or false.

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103. Answer the foll. Question : 2.show that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right), (abc \neq 0)$

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104. Evaluate: $\int \frac{dx}{\sqrt{\sin^3 x \sin(x+\alpha)}}$

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105. Evaluate: $\int\left(\log(\log x)+\frac{1}{(\log x)^2}\right)dx$

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106. Solve:$\cos^2 x\frac{dy}{dx}+y=\tan x\left(0\le x\le\frac{\pi}{2}\right)$.

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107. Prove, by vector method or otherwise, that the point of intersection of the diagonals of a trapezium lies on the line passing through the midpoint of the parallel sides (you may assume that the trapezium is not a parallelogram).

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108. Find the value of λ if three vectors $\vec{a}=2\hat{i}-\hat{j}+\hat{k},\ \vec{b}=\hat{i}+2\hat{j}-3\hat{k}$ and $\vec{c}=3\hat{i}+\lambda j+5\hat{k}$ are

coplanar.

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109. A candidate is selected for interview for the three posts. For the first post there are 3 candidates, for the second there are 4 and for the third there are 2. what is the probability that the candidate getting at least one post?

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110. For a random variable X, it is given, E(x) = 10 and var(x) = 25. Find the positive values of a and b such that Y = aX-b have expectation 0 and variance 1.

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111. A stone is dropped into a quiet lake and waves moves in circles at a speed of 4 cm/sec. At the instant when the radius of the circular wave is 10 cm, how fast is the enclosed area increasing?

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112. If the sum of the lengths of the hypotenuse and another side of a right-angled triangle is given, show that the area of the triangle is maximum when the angle between these sides is $\frac{\pi}{3}$.

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113. Find the equations of the tangents to the ellipse $2x^2 + 3y^2 = 30$, which are parallel to the straight line x + y + 18 = 0.

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114. Find the foot of the perpendicular drawn from the point $\left(2\hat{i}-\hat{j}+5\hat{k}\right)$ to the line $\vec{r}=\left(11\hat{i}-2\hat{j}-8\hat{k}\right)+t\left(10\hat{i}-4\hat{j}-11\hat{k}\right)$. Find also the length of the perpendicular.

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115. Show that the equation of the plane passing through the point (1,2,3) and parallel to the plane. 3x + 4y - 5z = 3 is given by 3x + 4y - 5z = -4.

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116. The mapping $f: A \to B$ is invertible if it is

A. injective

B. surjective

C. bijective

D. none of these.

Answer:

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117. If $\sec^{-1} x = \operatorname{cosec}^{-1} y$ state which of the following is the value of $\left(\cos^{-1}\left(\frac{1}{x}\right) + \cos^{-1}\left(\frac{1}{y}\right)\right)$?

A. π

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

C. $\frac{5\pi}{3}$

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

Answer:

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118. If $A = [a_{ij}]$ is a 2×2 matrix such that $a_{ij} = i + 2j$, then A will be

A. $\begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$

B. $\begin{bmatrix} 2 & 4 \\ 3 & 5 \end{bmatrix}$

C. $\begin{bmatrix} 3 & 5 \\ 4 & 6 \end{bmatrix}$

D. none of these.

Answer:

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119. The greatest integer fuction f(x) = [x] is

A. continuous for all real values of x

B. continuous only at non integral values of x

C. continuous at intgral values of x

D. none of these.

Answer:

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120. The value of $\int e^{5\log x}dx$ is

A. $\frac{e^{5\log x}}{5}+c$

B. $\frac{e^{5\log x}}{5\log x}+c$

C. $\frac{x^5}{5}+c$

D. $\frac{x^6}{6}+c$

Answer:

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121. The slope of the tangent to the curve xy=c^2 at $\left(ct, \frac{c}{t}\right)$ is

A. $-\frac{1}{t}$

B. $\frac{1}{t^2}$

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

D. $\frac{1}{t^2}$

Answer:

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122. $\hat{i} + 2\hat{j}$ and $-\hat{i} + m\hat{j}$ are given as collinear vectors, then the value of m is

A. 2

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

C. -2

D. $-\frac{1}{2}$

Answer:

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123. The line joining the points (1,1,2) and (3,-2,1)meets the plane 3x + 2y + z = 6 is

A. (-3,-2,1)

B. (3,-2,1)

C. (-3,2,1)

D. (3,2,1)

Answer:

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124. If the odds in favour of an event are $9:4$, then its probability of occurrence is

A. $\frac{9}{13}$

B. $\frac{4}{13}$

C. $\frac{4}{9}$

D. $\frac{5}{13}$

Answer:

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125. The S.D. of a binomial distribution with parameteres n and p is

A. np

B. $\sqrt{np}$

C. $\sqrt{(np)(1-p)}$

D. $2\sqrt{np}$

Answer:

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126. Let $S = N \times N$and $*$ is a binary operation on S defined by $(a, b)^*(c, d)$ = (a+c, b+d) for all $a, b, c, d \in N$.Prove that $*$ is an associate binary operation on S.

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127. Prove that, $2\sin^{-1} x = \sin^{-1}\left(2x\sqrt{1-x^2}\right)$

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128. prove without expanding, $\begin{vmatrix} (a-b) & 1 & a \\ b-c & 1 & b \\ c-a & 1 & c \end{vmatrix} = \begin{vmatrix} a & 1 & b \\ b & 1 & c \\ c & 1 & a \end{vmatrix}$

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129. If two matrices A and B of orders $2 \times m$ and $3 \times n$ respectively are conformable for the product AB of order $p \times 4$, find the values of m, n and p.

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130. Evaluate: $\lim_{x \to 0} \frac{\log(1+\alpha x)}{\sin \beta x}$

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131. If $y = \log_x \tan x$, find $\frac{dy}{dx}$.

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132. $\int_{-\pi/2}^{\pi/2} |\sin x| dx$ =

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133. Form the diffential equation of family of parabolas having vertex at the origin and axis along positive y-axis.

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134. If f(x) = $(x-1)e^x + 1$, show that f(x) is positive for all positive values of x.

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135. Using direction ratios show that the points (2,6,3),(1,2,7) and (3,10,-1) are collinear.

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136. Find the equation of the plane which passing through the point $\hat{i} + \hat{j} + \hat{k}$ and parallel to the plane $\vec{r} \cdot \left(2\hat{i} - \hat{j} + 2\hat{k}\right)$ = 0.

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137. For three mutually exclusive events X,Y and Z it is given that P(x) = 2P(Y) = 3P(Z) and XUYUZ = s, where S denotes sure events, find the value of P(X).

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138. A discrete random variable X has the following distribution:

X	−1	0	1	2	3	4	5	6
p(x)	0·1	a	· 2a	0·2	3a	4a	0·2	5a

find a.

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139. If xy = $1 + a^2$ then show that,

$$\tan^{-1}\left[\frac{1}{a+x}\right] + \tan^{-1}\left[\frac{1}{a+y}\right] = \tan^{-1}\left[\frac{1}{a}\right], x + y + 2a \neq 0.$$

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140. By using properties of determinants. Show that:

$$\left|1+a^2-b^2;\ 2ab;\ -2b:2ab;\ 1-a^2+b^2;\ 2a:2b;\ -2a;\ 1-a^2-b^2\right| = (1-$$

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141. If $y = f\left(x^2\right)$ and $f'(x) = \sqrt{3x^2+1}$, find $\left[\frac{dy}{dx}\right]_{x=2}$

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142. If $y = \left(\tan^{-1} x\right)^2$, then show that $\left(1+x^2\right)^2 \frac{d^2y}{dx^2} + 2x\left(1+x^2\right)\frac{dy}{dx} = 2.$

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143. Prove that, $\int \frac{\cos 5x + \cos 4x}{1-2\cos 3x} dx = -\left(\frac{1}{2}\sin 2x + \sin x\right) + c$

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144. Solve: $\frac{dy}{dx} = \frac{3x + 4y + 1}{-4x + 2y - 3}$

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145. Solve: $(x^2 - 1)\frac{dy}{dx} + 2xy = \frac{2}{x^2 - 1}$

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146. $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = -2\hat{i} + \hat{j} + 2\hat{k}$ represent two adjacent sides of a parallelogram. Find unit vectors in directions parallel to the diagonals of the parallelogram.

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147. Find the vector α which is perpendicular to both $4\hat{i} + 5\hat{j} - \hat{k}$ and $\hat{i} - 4\hat{j} + 5\hat{k}$ and which satisfies the relation $\alpha.\beta = 21$ where $\beta = 3\hat{i} + 5\hat{j} - \hat{k}$.

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148. Show that: $\int_0^1 \left(\frac{\log(1+x)}{1+x^2}\right)dx = \frac{\pi}{8}\log 2.$

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149. Evaluate:

$$\lim_{n\to\infty} \frac{1}{n}\left[\sin\left(\frac{\pi}{2n}\right) + \sin\left(\frac{2\pi}{2n}\right) + \sin\left(\frac{3\pi}{2n}\right) + \ldots\ldots + \sin\left(\frac{n\pi}{2n}\right)\right]$$

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150. A random variable X has the following probability function:

x	−2	−1	0	1	2	3
p(x)	0·1	k	0·2	2k	0·3	3k

Calculated K.

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151. A random variable X has the following probability function:

x	−2	−1	0	1	2	3
p(x)	0·1	k	0·2	2k	0·3	3k

Find $P(x < 2), P(x \geq 2), P(-2 < x \leq 2)$

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152. A random variable X has the following probability function:

x	−2	−1	0	1	2	3
p(x)	0·1	k	0·2	2k	0·3	3k

Calculate the minimum value of K.such that $P(x \leq 1) > 0.36$.

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153. Show that the maximum value of $2x + \frac{1}{2x}$ is less than its minimum value.

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154. answer any one question : (ii) find the equation of the line which is perpendicular to both of the lines $\frac{x}{2}=\frac{y}{1}=\frac{z}{3}$ and $\frac{x-3}{-1}=\frac{y-2}{3}=\frac{z+5}{5}$ and passing through the point (1,2,3)

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155. Find the value of $\tan^{-1}\left\{2\cos\left(2\frac{\sin^{-1}1}{2}\right)\right\}$. (Consider principal values only).

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156. If $f(x)=x^2-5x+10$ and A = $\begin{bmatrix}1 & -2\\ 3 & 4\end{bmatrix}$, find f(A).

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157. Solve for x:

$$\begin{bmatrix} 15-2x & 11 & 10 \\ 11-3x & 17 & 16 \\ 7-x & 14 & 13 \end{bmatrix} = 0$$

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158. Differentiate $\frac{\tan^{-1}\left(\sqrt{1+x^2}-1\right)}{x}$ w,r,t. $\tan^{-1} x$

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159. Find if Lagrange's Mean Value Theorem is applicable to the function

f(x) = $x + \frac{1}{x}$ in [1,3]

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160. Evaluate:

$$\int \cos(\log x)\, dx.$$

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161. Show that a right triangle of given hypotenuse has maximum area, when it is an isosceles triangle.

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162. Find the interval in which f(x) = sinx + cos x.$[x \in [0, 2\pi]]$ increases.

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163. Evaluate:

$$\int_0^1 \left(\frac{1}{1+x}\right) dx.$$

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164. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are such that $\vec{a} \times \vec{b} = \vec{c}$ and $\vec{b} \times \vec{c} = \vec{a}$, prove that $\vec{a}$, $\vec{b}$ and $\vec{c}$ are mutually perpendicular $\left|\vec{b}\right|$=1 and $\left|\vec{c}\right| = \left|\vec{a}\right|$.

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165. Find the angle between the lines $\vec{r} = \left(2\hat{i} - \hat{j} + 3\hat{k}\right) + \lambda\left(\hat{i} + \hat{j} + 2\hat{k}\right)$ and $\vec{r} = \left(\hat{i} - 3\hat{j}\right) + \mu\left(2\hat{j} - \hat{k}\right)$

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166. If P(A) = 2P(B) = $\frac{2}{5}$ and $P\left(\frac{B}{A}\right) = \frac{1}{3}$, find $P\left(\frac{A}{B}\right)$ and $P(A \cup B)$.

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167. A pair of dice is thrown 3 times. Find the probability of getting a doublet exactly two times.

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168. If $\tan^{-1}\left[\frac{yz}{xr}\right]+\tan^{-1}\left[\frac{zx}{yr}\right]+\tan^{-1}\left[\frac{xy}{zr}\right]=\frac{\pi}{2}$ prove that, $x^2+y^2+z^2=r^2$.

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169. If $A=\begin{bmatrix}1 & -1\\ 2 & -1\end{bmatrix}, B=\begin{bmatrix}a & 1\\ b & -1\end{bmatrix}$ and $(A+B)^2=A^2+B^2$ find a and b.

Watch Video Solution

170. Prove that, $\begin{bmatrix}1+x & 1 & 1\\ 1 & 1+y & 1\\ 1 & 1 & 1+z\end{bmatrix}$ = $xyz\left(1+\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$

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171. Solve : $\begin{bmatrix} x-2 & 2x-3 & 3x-4 \\ x-4 & 2x-9 & 3x-16 \\ x-8 & 2x-27 & 3x-64 \end{bmatrix}$ =0

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172. If $\sin y = x\sin(a+y)$ then show that $\frac{dy}{dx} = \frac{\sin a}{1-2x\cos a+x^2}$.

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173. Evaluate: $\int e^{4x}\sin 3x dx$

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174. Evaluate: $\int \frac{\tan\theta d\theta}{1-\sin\theta}$

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175. Solve:(x+y+1)dx + (2x+2y-1)dy = 0

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176. solve: $\frac{dy}{dx} + \frac{\sin 2y}{x} = x^3 \cos^2 y.$

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177. If the vectors $a\hat{i} + \hat{j} + \hat{k}$, $\hat{i} + b\hat{j} + \hat{k}$ and $\hat{i} + \hat{j} + c\hat{k}$ are coplanar where $a \neq 1, b \neq 1, c \neq 1$, prove that $\frac{1}{1-a} + \frac{1}{1+b} + \frac{1}{1-c} = 1.$

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178. If $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ then prove that $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a}.$

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179. Evaluate (with the help of definite integral):

$$\lim_{n\to\infty}\left\{\left(1+\frac{1}{n}\right)\left(1+\frac{2}{n}\right)\ldots\left(1+\frac{n}{n}\right)\right\}^{\frac{1}{n}}$$

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180. find the value of $\int_2^3 a^x dx (a<0)$.

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181. Two cards are drawn successively with replacement from a well-shuffled pack of 52 cards. Find the mean and variance the number of kings.

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182. Find the maximum value of $f(x)=\left(\frac{1}{x}\right)^x$

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183. Solve: $xdx + ydy + \frac{xdy - ydx}{x^2 + y^2}$=0 given y = 1 when x= 1.

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184. Find the equation of the plane which contains the two parallel line:

$\frac{x-4}{1} = \frac{y-3}{-4} = \frac{z-2}{5}$ and $\frac{x-3}{1} = \frac{y+2}{-4} = \frac{z}{5}$

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185. A and B are two independent events such that $P(A \cup B)$ = 0.8 and P(A) = 0.3. P(B) is.....

A. $\frac{5}{7}$

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

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

D. $\frac{1}{8}$

Answer:

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186. $\vec{a}, \vec{b}, \vec{c}$ are three mutually perpendicular unit vectors then $\left|\vec{a}+\vec{b}+\vec{c}\right|$ is equal to

A. 1

B. $\sqrt{3}$

C. 3

D. $\frac{1}{3}$

Answer:

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187. The value of x if $\tan^{-1} x + 2\cot^{-1} x = \frac{2\pi}{3}$ is

A. $\sqrt{3}$

B. $\sqrt{2}$

C. 2

D. 3

Answer:

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188. The degree of the differential equation $\frac{d^3y}{dx^3} + x\left(\frac{dy}{dx}\right)^4 = 4\left(\frac{d^4y}{dx^4}\right)$

A. 1

B. 3

C. 4

D. undefined.

Answer:

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189. If f(x) = [x] and g(x)=|x| the value of $f\left(g\left(\frac{8}{5}\right)\right)-g\left(f\left(-\frac{8}{5}\right)\right)$ is

A. 2

B. 1

C. -1

D. -2

Answer:

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190. A random variable x takes values 0,1,2,3.....wiht probability $P(X=x)=K(x+1)\left(\frac{1}{5}\right)^{x}$,where K is a constant,P(X=0)is

A. $\frac{7}{25}$

B. $\frac{18}{25}$

C. $\frac{13}{25}$

D. $\frac{16}{25}$

Answer:

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191. The angle between the planes 2x - y +z = 6 and x + y+2z = 7 is

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

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

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

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

Answer:

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192. Statement - 1 : The value of the integral

$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{\tan x}}$ is equal to $\frac{\pi}{6}$

Statement-2 : $\int_a^b f(x) = \int_a^b f(a+b-x)dx$

A. 0

B. 1

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

D. $\frac{\pi}{12}$

Answer:

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193. If $A = \begin{bmatrix} 0 & 2 \\ 3 & -4 \end{bmatrix}, kA = \begin{bmatrix} 0 & 3a \\ 2b & 24 \end{bmatrix}$ then find the value of k+a+b.

A. $6, -12, -18$

B. $-4, 6, 9$

C. $-6, \ -4, \ -9$

D. $6, \ -4, 9.$

Answer:

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194. Prove that, $\tan^{-1}\left(\frac{4}{3}\right)+\tan^{-1}\left(\frac{12}{5}\right)=\pi-\tan^{-1}\left(\frac{56}{33}\right).$

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195. Without expanding, prove that $\begin{bmatrix} 41 & 1 & 5 \\ 79 & 7 & 9 \\ 29 & 5 & 3 \end{bmatrix}$=0

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196. Verify that the matrix equation $A^2-4a+3I$=0 is satisfied by the matrix $A=\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$, where $I=\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $0=\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$,

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197. Evaluate $\lim_{x \to 0} \frac{e^{px} - e^{-qx}}{x}$

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198. Find $\frac{dy}{dx}$, whne $y = \log\left(x + \sqrt{x^2 - a^2}\right)$

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199. Examine whether Rolle's theorem is applicable to the following function in the given intervals: $f(x) = \cos x \in -\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$

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200. Evaluate: $\int \frac{x dx}{\sqrt{3x^2 + 1}}$

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201. Find the intervals in which the function $f(x) = \frac{x}{x^2+1}$ is decreasing.

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202. Using differentials, find the approximate value of $(82)^{\frac{1}{4}}$.

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203. If the vectors $3\hat{i} - 2\hat{j} + m\hat{k}$ and $-2\hat{i} + \hat{j} + 4\hat{k}$ are perpendicular to each other, find the value of m.

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204. Can the numbers $\frac{1}{2}, -\frac{1}{\sqrt{2}}, -\frac{1}{2}$ be the direction cosines of a straight line? Give reason.

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205. Prove that, if $P(A/B) = P(A)$ then $P(A^c/B) = P(A^c)$.

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206. If the probability of success in a single trials is 0.05, how many Bernoulli trials must be performed in, order that the probability of at least one success is $\frac{2}{3}$ or more.

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207. Prove that, $\begin{vmatrix} \sin A & \cos A & \sin(A+\theta) \\ \sin B & \cos B & \sin(B+\theta) \\ \sin C & \cos c & \sin(C+\theta) \end{vmatrix}$=0

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208. If A,B,C be the angles of a triangle, then prove that ,

$$\begin{vmatrix} -1 & \cos C & \cos B \\ \cos C & -1 & \cos A \\ \cos B & \cos A & -1 \end{vmatrix} = 0$$

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209. Solve: $\begin{vmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix} = 0$

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210. If A = $\begin{vmatrix} 1 & 2 & -3 \\ 2 & 3 & 2 \\ 3 & -3 & -4 \end{vmatrix}$, find A^{-1}

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211. If f(x) = $x\sqrt{x^2+a^2} + a^2 \log\left(x\sqrt{x^2+a^2}\right)$ then find the value of f(0).

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212. If $y = a\cos(\log x) + b\sin(\log x)$, show that,$x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$

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213. Integrate: $\int\frac{2x^2 - 3x + 9}{x^2 + 4x - 5}dx$

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214. Evaluate: $\int\frac{(x - l)(x - m)}{(x - a)(x - b)}dx$

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215. Solve: $\left(1 + x^2\right)\frac{dy}{dx} + 2xy = \sqrt{x^2 + 4}$

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216. Solve: $\log \frac{dy}{dx}$ = 4x - 2y-2`: given y = 1, when x = 1.

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217. (d) answer any one question : (i) if three vectors $\vec{a}, \vec{b}$ and $\vec{c}$ of magnitudes 3,4and5 are such that each vector is perpendicular to the sum of the other two vectors,then prove that $\left|\vec{a}+\vec{b}+\vec{c}\right| = 5\sqrt{2}$.

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218. The position vectors of the points A,B,C and D are $6\hat{i}-7\hat{j}$, $16\hat{i}-29\hat{j}-4\hat{k}$, $3\hat{i}-6\hat{k}$ and $2\hat{i}+5\hat{j}+10\hat{k}$ respectively. Show that the points A,B,C and D are non coplanar.

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219. Show that,

$$\int_0^{\frac{\pi}{2}} \frac{\sin 2x\,dx}{\sin^4 x + \cos^4 x} = \frac{\pi}{2}$$

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220. Evaluate: $\int_0^{\frac{\pi}{4}} \log(1 + \tan\theta)\,d\theta.$

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221. The probability that three is at least one error in an accounts statements prepared by A is 0.2 and for B and C they are 0.25 and 0.4 respectively A,B and C prepared 10,16,20 startment respectively. Find the expected number of correct statements in all.

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222. A normal to the parabola $y^2 = 5x$ makes an angle 45° with line x-axis.

Find the equation of the normal and the coordinates of its foot.

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223. Show that, the function $f(x) = |x - 1|$ is not differentiable at x = 1

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224. Prove that the volume of the largest cone that can be inscribed in a sphere of radius R is $\frac{8}{27}$ of the volume of the sphere.

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225. Find the distance of the point (1,2,3) from the line

$$\frac{x-6}{2} = \frac{y-7}{2} = \frac{z-7}{-3}.$$

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226. ©answer any one question: (i) find the vector equation of the plane at a distance $\frac{6}{\sqrt{29}}$ unit from the origin and perpendicular to the vector $2\hat{i} - 3\hat{j} + 4\hat{k}$. Also convert this equation in cartesian form.

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227. Find the order of the differential equation

$$\left(\frac{d^4y}{dx^4}\right)^3 - \frac{d^3y}{dx^3} = \sqrt{1 + \frac{dy}{dx}}$$

A. 6

B. 4

C. 3

D. 7

Answer:

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228. If $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}^n = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then the value of n is

A. 2

B. 3

C. 4

D. 6

Answer:

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229. The S.D. of a binomial distribution with parameteres n and p is

A. no

B. $\sqrt{n}p$

C. $\sqrt{n}p(1-p)$

D. $\sqrt[2]{np}$

Answer:

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230. The angle between the lines whose direction ratios are proportional to 1, -2, 1 and 4, 3, 2 is.....

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

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

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

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

Answer:

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231. If $\overrightarrow{\alpha} = 2\hat{i} + 3\hat{j} - 6\hat{k}$ and $\overrightarrow{\beta} = p\hat{i} - \hat{j} + 2\hat{k}$ are two parallel vectors, then the value of p is

A. $-\frac{1}{3}$

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

C. $-\frac{2}{3}$

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

Answer:

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232. Which of the following solution of the differential equation dx - dy + y dx + xdy = 0 is not admissible?

A. log|(x-1) (y+1)| = c

B. $(x-1)^2\{(y+1)^2 = c^2$

C. -log$|(x-1)(y+1)| = \log c$

D. $\log(x+1)(y-1) \mid = \log c.$

Answer:

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233. Three events A,B and C are mutually exclusive and exhaustive , if P(A)=3/5 and P(B)=1/6, then the value of P(C) is

A. $\frac{23}{30}$

B. $\frac{7}{30}$

C. $\frac{1}{10}$

D. $\frac{9}{10}$

Answer:

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234. If for a random variable x, the variance of x is 1.84 and the expectation of x is 3.6, then the expectation of x^2 is

A. 14.8

B. 11.12

C. 5.44

D. 6.98

Answer:

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235. Find the value of sin $\cot^{-1}\cos\left(\tan^{-1}(2)\right)$

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236. A binary operation * is defined on the set of real numbers R by a*b = 2a + b - 5 for all a, b $\in$ R

If 3* (x*2) = 20, find x

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237. Solve for a,b,c and d when $\begin{pmatrix} b+c & c+a \\ 7-d & 6-c \end{pmatrix} = \begin{pmatrix} 9-d & 8-d \\ a+b & a+b \end{pmatrix}$.

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238. Evaluate : $\begin{vmatrix} 0 & (a-b)^3 & (b-c)^3 \\ (b-a)^3 & 0 & (c-a)^3 \\ (c-b)^3 & (a-c)^3 & 0 \end{vmatrix}$

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239. Examine whether the following function is continuous at x = 0 .

$$\phi(x) = \begin{matrix} \frac{|x|}{x} & when & x \neq 0 \\ 0 & when & x = 0 \end{matrix}$$

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240. Find the differential co-efficient of $\log x_{10}$ with respect to $\tan^{-1} x$.

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241. Evaluate: $\int \left(\frac{\cos x + x \sin x}{x(x + \cos x)} \right) dx.$

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242. Find if Lagrange's Mean Value Theorem is applicable to the function f(x) = $x + \frac{1}{x}$ in [1,3]

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243. Eleminating a and b, find the differential equation of all ellipse of the form $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.$

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244. Evaluate : $\underset{x \to 0}{L} t(1+3x)^{\frac{x+2}{x}}$

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245. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors satisfying the condition $\vec{a} + \vec{b} + \vec{c} = 0$ then show that $\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a} = -3/2.$

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246. Find the value of λ so that the plane $\vec{r}.\left(\vec{i} + 2\vec{j} + 3\vec{k}\right)$ = 7 and $\vec{r}.\left(\lambda\vec{i} + 2\vec{j} - 7\vec{k}\right)$ = 26 are perependicular to each other.

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247. If $P(A) = \frac{1}{4}, P(B) = \frac{1}{3}$ and $P(A-B) = \frac{1}{6}$ then verify whether a and B are two independent event or not.

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248. An unbiased coin is tossed 6 times. Find the probability of at least five heads by binomial distribution.

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249. Given $A = \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix} \& B = \begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}$

Find AB

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250. Show that: $\begin{vmatrix} a & b-c & c+b \\ a+c & b & c-a \\ a-b & b+a & c \end{vmatrix} = (a+b+c)\left(a^2+b^2+c^2\right)$.

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251. Show that $\int \frac{2x+3}{x^2-3x+2} dx$

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252. If x = sinθ and y = cos pθ , p is constant, then find the value of $(1-x^2)y_2 - xy_1$

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253. The integral $\int \frac{\sec^2 x}{(\sec x + \tan x)^{\frac{9}{2}}} dx$ equals (for some arbitrary constant K). $(a) -\frac{1}{(\sec x + \tan x)^{\frac{11}{2}}}\left\{\frac{1}{11} - \frac{1}{7}(\sec x + \tan x)^2\right\} + K$

$(b) \frac{1}{(\sec x + \tan x)^{\frac{1}{11}}}\left\{\frac{1}{11} - \frac{1}{7}(\sec x + \tan x)^2\right\} + K$

$(c) -\frac{1}{(\sec x + \tan x)^{\frac{11}{2}}}\left\{\frac{1}{11} + \frac{1}{7}(\sec x + \tan x)^2\right\} + K$

$(d) \frac{1}{(\sec x + \tan x)^{\frac{11}{2}}}\left\{\frac{1}{11} + \frac{1}{7}(\sec x + \tan x)^2\right\} + K$

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254. Show that $\int \frac{2x+3}{x^2 - 3x + 2} dx$

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255. If θ be the angle between two unit vectors $\vec{e}_1$ and $\vec{e}_2$ then prove that $\left|\vec{e}_1 - \vec{e}_2\right| = 2\sin\left(\frac{\theta}{2}\right)$

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256. Evaluate (with the help of definite integral)

$$\underset{n\to\infty}{I}\, t\left(\frac{1}{n+1}+\frac{1}{n+2}+\ldots..+\frac{1}{6n}\right)$$

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257. Find the value of $\int_0^{\pi/2} \frac{1}{\left(b^2\cos^2 x + a^2\sin^2 x\right)}dx$

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258. A mawn takes a step forward with probability 0.4 and backward with probability 0.6 find the probability that the end of eleven steps he is just one step away from the starting point.

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259. A card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are drawn and are found to be both diamonds. Find the probability of the lost card being a diamond.

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260. If the area of the region $\{(x, y): 0 \leq y \leq x^2 + 1, 0 \leq y \leq x + 1, 0 \leq x \leq 2\}$ is A , then the value of $3A - 17$ is___

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261. (b)answer any two questions : (i) a circular ink blot grows at the rate of $2c\frac{m^2}{\sec}$ .find the rate at which the radius is increasing after $2\left(\frac{6}{11}\right)\sec onds$

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262. Find the distance of the point (1,-2,3) from the plane x - y +z = 5 measured along a line parallel in $\frac{x}{2}=\frac{y}{3}=\frac{z}{-6}$

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263. Let us consider a function f : $R \to R$, defined by f(x) $= x^3 - 6$. Show that the mapping f is bijective.

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264. Show that $\sec^2\left(\cot^{-1}(2)\right) + \cos ec^2\left(\tan^{-1}(3)\right) = 2\frac{13}{36}$

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265. If $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$ then show that A+A' is a symmetric matrix.

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266. Without expanding show that the determinant $\begin{vmatrix} 1 & a & a^2 \\ -1 & 2 & 4 \\ 1 & x & x^2 \end{vmatrix}$ has a factor (X-a)

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267. Examine the applicability of lagrange's Mean value theorem for the function f(x) = $x^2 + 2$ in the interval [2,4]

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268. If $\sin^{-1}\left(\frac{x^2 - y^2}{x^2 + y^2}\right) = k$, k is a constant, then prove that $\frac{dy}{dx} = \frac{y}{x}$.

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269. Evaluate: $\int\left(\frac{\cos x+x\sin x}{x(x+\cos x)}\right)dx.$

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270. Using the method of differentail find the approximate value of $\sqrt{0.24}$

.

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271. If $\vec{a}=3\hat{i}-2\hat{j}+\hat{k}$ and $\vec{b}=\hat{i}-3\hat{j}+\hat{k}$ find $\vec{a}\times\vec{b}$ also find the area of a parallelogram whose adjacent sides area $\vec{a}$ and $\vec{b}$

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272. If direction ratios of two lines are (a,b,c)and (b-c,c-a,a-b), find angle between them.

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273. Find the binomial distribution for which the mean and variance are 12 and 4 respectively.

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274. If for two events A and B, P(A) = $P\left(\frac{A}{B}\right) = \frac{1}{4}$ and $P\left(\frac{B}{A}\right) = \frac{1}{2}$, show that A and B are two mutually independent events.

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275. if $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \frac{\pi}{2}$ and $x + y + z = \sqrt{3}$, then show that x=y=z.

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276. If $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$, show that (pA + qB) (pA - qB) = $(p^2 + q^2)A$

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277. If x,y,z are all distinct and if $\begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix}$=0,show that xyz+1=0

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278. Solve for x : $\begin{vmatrix} x & a & b \\ a & x & b \\ a & b & x \end{vmatrix}$ = 0

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279. Find the derivation of $\sin^{-1}\left(x^2\sqrt{1-x}-\sqrt{x}\sqrt{1-x^4}\right)$ with respect to x.

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280. Evaluate : $\int \frac{x^2 dx}{(x\sin x+\cos x)^2}$

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281. Solve: $\frac{dy}{dx}+x(\sin 2y)=x^3\cos^2 y$, y(0) = then y(1) equal to

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282. The temperature T of a cooling object drops at a rate proportional to the difference (T-s) where S is a constant temperature of surrounding medium. If initially T = 150° C), find the temperature of the cooling object at any time t.

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283. If $\vec{a}$, $\vec{b}$ are unit vectors and θ be the angle between them show tat $\sin\left(\frac{\theta}{2}\right) = \frac{1}{2}\left|\vec{a} - \vec{b}\right|$

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284. If with reference to the right handed system of mutually perpendicular unit vectors $\hat{i}, \hat{j}$ and $\hat{k}$, , $\vec{\alpha} = 3\hat{i} - \hat{j}$, $\vec{\beta} = 2\hat{i} + \hat{j} - 3\hat{k}$, then express $\vec{\beta}$ in the form $\vec{\beta} = \vec{\beta}_1 + \vec{\beta}_2$, where $\vec{\beta}_1$ is parallel to $\vec{\alpha}$ and $\vec{\beta}_2$ is perpendicular to $\vec{\alpha}$.

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285. Evaluate :

$$\lim_{n \to \infty} t\left[\frac{1}{\sqrt{n^2 - 1^2}} + \frac{1}{\sqrt{n^2 - 2^2}} + \frac{1}{\sqrt{n^2 - 3^2}} + \ldots + \frac{1}{\sqrt{n^2 - (n-1)^2}}\right]$$

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286. Evaluate : $\int_0^{\log 5} \frac{e^x \sqrt{e^x - 1}}{e^x + 3} dx$

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287. A random variable X has the following probability function:

x	−2	−1	0	1	2	3
p(x)	0·1	k	0·2	2k	0·3	3k

Calculated K.

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288. A random variable X has the following probability function:

x	−2	−1	0	1	2	3
p(x)	0·1	k	0·2	2k	0·3	3k

Find $P(x < 2), P(x \geq 2), P(-2 < x \leq 2)$

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289. A random varible x has the following probability function:

x	-2	-1	0	1	2	3
$p(x)$	$0{\cdot}1$	k	$0{\cdot}2$	$2k$	$0{\cdot}3$	$3k$

the value of k and its mean

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290. Six coins are tossed at a time. Find the probability of occring not more than 3 heads.

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291. In a certain culture the number of bacteria at any instant increases at a rate proportional to the cube root of the number present at that

instant. If the number becomes 8 times in 3 hours, when the number will be 64 times?

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292. Find the equation of the common tangents to $y^2 = 8ax$ and $x^2 + y^2 = 2a^2$

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293. Prove that the radius of the right circular cylinder of greatest curved surface area which can be inscribed in a given cone is half of that of the cone.

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294. choose the correct alternative :(ii) state which of the foll. Is the value of $\tan\left(\left(\frac{1}{3}\right)\left(\tan^{-1}x + \tan^{-1}\left(\frac{1}{x}\right)\right)\right)$ (x>0)?

A. $\frac{1}{\sqrt{3}}$

B. $\sqrt{3}$

C. 1

D. 0

Answer:

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295. If A^t is the transporse of a square matrix A, then,

A. $|A| \neq |A^t|$

B. $|A| + |A^t|$

C. $|A| = |A^t|$

D. $|A| = |A^t|$ only when A is symmetric matrix.

Answer:

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296. If $\frac{d}{dx}\left(\frac{1+x^2+x^4}{1+x+x^2}\right)$ = ax + b , then the values of a and b are

A. $-2, 1$

B. 1,-2

C. $2, \ -1$

D. $-1, 2$

Answer:

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297. The rate average change of the function y = x^2 between x = 1 and x = 4 is

A. 1

B. 2

C. 5

D. 3

Answer:

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298. $\vec{a} = 3\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{b} = 2\hat{i} + 6\hat{j} + m\hat{k}$ are perpendicular to each other , then the value of m is

A. 0

B. 10

C. 24

D. -24

Answer:

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299. The straihgt line $\frac{x-4}{3}=\frac{y-2}{1}=\frac{z-1}{0}is$

A. Parallel to the axis

B. parallel to the y axis

C. Parallel to the z axis

D. perpendicualr to the z axis.

Answer:

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300. A and B give examination for two empty posts. If the probability of their getting selected by $\frac{1}{4}$ and $\frac{1}{6}$ respectively then the probability of neither getting selected will be

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

B. $\frac{5}{8}$

C. $\frac{23}{24}$

D. $\frac{5}{12}$

Answer:

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301. The variance of a binomial distribution with parameters n and p is-

A. $> n^2)\frac{}{4}$

B. $> \frac{n}{4}$

C. $\geq \frac{n}{4}$

D. $\leq \frac{n}{4}$

Answer:

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302. Number of relations of a set having 5 elements are

A. 5

B. 25

C. 2^5

D. 2^{25}

Answer:

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303. If a matrix A = $\left(\alpha_{i_j}\right)_{3\times 4}$ and $\alpha\left(i_j\right)$ = $(-1)^{\hat{i}+\hat{j}}$, then the element fo 3rd row and 2nd column will be

A. 1

B. -1

C. 2

D. 0

Answer:

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304. If f(x) = $\log_e\left(\frac{1-x}{1+x}\right)$, then f'$(0)$ is

A. 2

B. -2

C. 0

D. $-1/2$

Answer:

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305. Find the interval of the function f(x) = x^3 in which it is increasing

A. $(-\infty, \propto)$

B. $(0, \propto)$

C. $(-\propto, 0)$

D. $(\propto, 0)$

Answer:

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306. A and B are two independent events P(A) = $\frac{1}{3}$ and $P(A \cap B) = \frac{1}{6}$, then $P\left(A^C \cap B^C\right)$ will be

A. $\frac{1}{6}$

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

C. $\frac{1}{3}$

D. $\frac{2}{9}$

Answer:

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307. The value of $\int_{-1}^{1} |2x+1| dx$ is

A. $\frac{5}{2}$

B. $\frac{9}{2}$

C. $\frac{3}{2}$

D. 1

Answer:

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308. find the length of the perpendicular drawn from the point (2,1,-1) on the line x - 2y + 4z = 9

A. $\frac{\sqrt{13}}{21}$

B. $\frac{13}{21}$

C. $\frac{13}{\sqrt{21}}$

D. $\frac{\sqrt{13}}{21}$

Answer:

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309. If $\sin^{-1} x - \cos^{-1} x = \frac{\pi}{6}$ then x is

A. 1

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

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

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

Answer:

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310. The I.F. of the differential equation x log x $\frac{dy}{dx} + 2y = \log x$ is

A. $(\log x)^2$

B. x^2

C. $\log x$

D. $\frac{1}{\log x}$

Answer:

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311. Let * be a binary operations on Z and is defined by , a * b = a + b + 1, $a, b \in Z$. Find the identity element.

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312. Evaluate: $4\left(2\tan^{-1}\left(\frac{1}{3}\right)+\tan^{-1}\left(\frac{1}{7}\right)\right)$

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313. Prove that (a+b+c+x) is a factor of $\begin{vmatrix} x+a & b & c \\ b & x+c & a \\ c & a & x+b \end{vmatrix}$

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314. If P = $\begin{pmatrix} 1 & 2 & 1 \\ 1 & 3 & 1 \end{pmatrix}$ and Q = PP^T , then find Q

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315. Verify Rolle's theorem for the function f(x) = sin x + cosx in the interval $o \leq x \leq \pi/2$

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316. Evaluate : $\underset{x \to 0}{L} t \frac{\log_e \cos x}{\sin^2 x}$

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317. Evaluate: $\int\left(\frac{\cos x+x \sin x}{x(x+\cos x)}\right) dx.$

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318. If $x>\frac{1}{2}$, show that the function f(x) = $x\left(4x^2-3\right)$ is steadily increasing.

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319. If $\left|\vec{a}\right|=\sqrt{3}, \left|\vec{b}\right|=2$ and $\vec{a} . \vec{b}=\sqrt{6}$, then find the angle between $\vec{a}$ and $\vec{b}$.

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320. If the line $\frac{x-2}{6}=\frac{y-1}{\lambda}=\frac{z+5}{-4}$ is perpendicular to the straight line 3x - y - 2z = 7, then find the value of λ

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321. The probability that A hits a target is $\frac{1}{3}$ and the probability that B hits it is $\frac{2}{5}$. What is the probability that the target will be hit if both A and B shoot at it?

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322. An unbiased coin is toosed 7 times. Find the probability of getting an least 6 heads by binomial distribution.

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323. answer any one question : (ii) prove that , $\tan\left(\frac{\pi}{4}+\frac{1}{2}\left(\cos^{-1}\left(\frac{a}{b}\right)\right)\right)+\tan\left(\frac{\pi}{4}-\frac{1}{2}\left(\cos^{-1}\left(\frac{a}{b}\right)\right)\right)=\frac{2b}{a}$.

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324. Solve : $\begin{vmatrix} x+4 & 2x & 2x \\ 2x & x+4 & 2x \\ 2x & 2x & x+4 \end{vmatrix} = 0$

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325. By using properties of determinants. Show that:

$\left|1+a^2-b^2; 2ab; \ -2b: 2ab; 1-a^2+b^2; 2a: 2b; \ -2a; 1-a^2-b^2\right| = (1 -$

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326. If $y^{\frac{1}{3}} + y^{-\frac{1}{3}} = 2x$, prove that $\left(x^2-1\right)y_2 + xy_1 = 9y.$

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327. Evaluate : $\int \frac{\log_e(x+1)}{(x+1)^2} dx$

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328. Evaluate : $\int\left(5^{5^{5^x}\cdot 5^{5^x}\cdot 5^x}\right)dx$

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329. Solve the differential equation: $\left(1+y^2\right)+\left(x-e^{\tan^{-1}y}\right)\frac{dy}{dx}=0$

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330. Find the unit vector which is perpendicular to both $\vec{a}=2\hat{i}+3\hat{j}-\hat{k}$ and $\vec{b}=3\hat{i}-\hat{j}+\hat{k}$ and also find the angle between them.

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331. If $\vec{a}=\hat{i}+\hat{j}+\hat{k}$, $\vec{b}=\hat{j}-\hat{k}$ then find a vector $\vec{c}$, such that $\vec{a}\times\vec{c}=\vec{b}$ and $\vec{a}.\vec{c}=3$.

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332. Evaluate:

$$\underset{n\to\alpha}{Lt}\left[\frac{1}{\sqrt{2n-1^2}}+\frac{1}{\sqrt{4n-2^2}}+\frac{1}{\sqrt{6n-3^2}}+\ldots+\frac{1}{n}\right]$$

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333. Evaluate : $\int_0^{\frac{\pi}{4}} \frac{\sin^2 x\cos^2 x dx}{\left(\sin^3 x+\cos^3 x\right)^2}$

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334. A discreate random variable x has the following probability distribution:

x	4	5	6	8
$p(x)$	0·1	0·3	0·4	0·2

Find mean and standard deviation.

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335. answer any two questions :(iii) if the straight line lx+my=n be a normal to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$, then by the application of calculus prove that $\frac{a^2}{l^2} - \frac{b^2}{m^2} = \frac{\left(a^2 + b^2\right)^2}{n^2}$.

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336. Find the area enclosed by the curves $x^2 = y, y = x + 2$ and x-axis

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337. A 5 ft long man walks away from the foot of a $12\frac{1}{2}$ ft high lamp post at the rate of 3 mile/h. Find the rate at which his shadow is increasing.

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