MATHS

BOOKS - UNITED BOOK HOUSE

SET 18

Exercise

1. 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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2. 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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3. If $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$ then show that A+A' is a symmetric matrix.

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4. 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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5. 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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6. 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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7. Evaluate: $\int\left(\frac{\cos x + x\sin x}{x(x+\cos x)}\right)dx.$

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

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9. 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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10. 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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11. Find the binomial distribution for which the mean and variance are 12 and 4 respectively.

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12. 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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13. 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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14. 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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15. 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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16. Solve for x : $\begin{vmatrix} x & a & b \\ a & x & b \\ a & b & x \end{vmatrix}$ = 0

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

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

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20. 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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21. 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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22. 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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23. Evaluate :

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

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

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25. 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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26. 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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27. A random varible x has the following probability function:

x	-2	-1	0	1	2	3
$p(x)$	0·1	k	0·2	$2k$	0·3	$3k$

the value of k and its mean

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

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

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31. 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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32. 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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33. 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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34. 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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35. 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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36. $\vec{a} = 3\hat{i} + 3\hat{j} - \hat{k}$ 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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37. 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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38. 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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39. 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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