MATHS

BOOKS - UNITED BOOK HOUSE

SET 13

Exercise

1. 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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2. 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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3. 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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4. 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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5. 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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6. 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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7. 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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8. 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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9. 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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10. Prove that,

$\{\cos(\sin^{-1} x)\}^2 = \{\sin(\cos^{-1} x)\}^2$.

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11. 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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12. 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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13. Examine whether f(x) = $|x|$ has a derivative at x = 0.

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14. State Lagrange's mean value theorem.

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

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

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

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

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

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21. 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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22. 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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23. 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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24. $(AB)^{-1} = B^{-1}A^{-1}$ where A and B are invertible matrices satisfying commutative property with respect to multiplication. Write true or false.

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

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

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28. Solve:

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

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29. 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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30. 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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31. 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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32. 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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33. 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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34. 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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35. 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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36. 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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37. 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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