MATHS

BOOKS - SURA MATHS (TAMIL ENGLISH)

QUESTION PAPER -19

Section I

1. The value of x, for which the matrix A = $\begin{bmatrix} e^{x-2} & e^{7+x} \\ e^{2+x} & e^{2x+3} \end{bmatrix}$ is singular is

A. 7

B. 6

C. 9

D. 8

Answer:

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2. The n^{th} term of the sequence 2, 7, 14, 23, ...is:

A. $n^2 + 2n + 1$

B. $n^2 + 2n - 1$

C. $n^2 - 2n - 1$

D. $n^2 - 2n + 1$

Answer:

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3. $\int \frac{\sec x}{\sqrt{\cos 2x}} dx =$

A. $\tan^{-1}(\cos x) + c$

B. $\sin^{-1}(\tan x) + c$

C. $\tan^{-1}(\sin x) + c$

D. $2\sin^{-1}(\tan x) + c$

Answer:

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4. The line $\frac{x}{a} - \frac{y}{b} = 0$ has the slope 1, if:

A. a = b

B. only for a = 1, b = 1

C. $a > b$

D. $a < b$

Answer:

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5. The number of five digit numbers in which all digits are even, is :

A. 4×5^4

B. 4×5^5

C. 5^5

D. 5×5

Answer:

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6. If $f(x) = \begin{cases} 2a - x, & \text{for} \quad -a < x < a \\ 3x - 2a, & \text{for} \quad x \geq a \end{cases}$ then which of the following is true?

A. f(x) is continuous for all x in R

B. f(x) is differentiable for all $x \geq a$

C. f(x) is not differentiable at x = a

D. f(x) is discontinuous at x = a

Answer:

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7. A number is selected from the set {1,2,3, . . .20}. The probability that the selected number is divisible by 3 or 4 is . . .

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

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

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

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

Answer:

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8. Which of the following is not a periodic function with period 2π?

A. tan x

B. cos x

C. sin x

D. cosec x

Answer:

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9. Straight line joining the points (2,3) and (-1,4) passes through the point (α, β) if

A. $\alpha + 3\beta = 11$

B. $3\alpha + \beta = 11$

C. $\alpha + 2\beta = 7$

D. $3\alpha + \beta = 9$

Answer:

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10. The minimum and the maximum values of $|\cos x| - 2$ are respectively :

A. 0 and 2

B. -2 and 0

C. -2 and -1

D. -1 and 1

Answer:

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11. If

$A = \{(x, y) / y = e^x, x \in [0, \infty)\}$ and $B = \{(x, y) / y = \sin x, x \in [0, \infty)$

then $n(AnB)$ is

A. ∞

B. 1

C. ϕ

D. 0

Answer:

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12. For the function $f(x) = \begin{cases} x+2, & x > 0 \\ x-2, & x < 0 \end{cases}$

A. $\lim_{x \to 2^-} f(x) = -1$

B. $\lim_{x \to 0} f(x)$ does not exist

C. $\lim_{x \to 0^-} f(x) = -1$

D. $\lim_{x \to 0^+} f(x) = 1$

Answer:

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13. If $f(x) = x^2 - 3x$, then the points at which f(x) = f'(x) are :

A. both irrational

B. one rational and another irrational

C. Both positive integers

D. both negative integers

Answer:

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14. The unit vector parallel to the resultant of the vectors $\hat{i}+\hat{j}+\hat{k}$ and $\hat{i}-2\hat{j}+\hat{k}$ is:

A. $\frac{2\hat{i}-\hat{j}+\hat{k}}{\sqrt{5}}$

B. $\frac{2\hat{i}-\hat{j}}{\sqrt{5}}$

C. $\frac{\hat{i}-\hat{j}-\hat{k}}{\sqrt{5}}$

D. $\frac{2\hat{i}+\hat{j}}{\sqrt{5}}$

Answer:

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15. It is given that the events A and B are such that $P(A) = \frac{1}{4}, P(A/B) = \frac{1}{2}$ and $P(B/A) = \frac{2}{3}$. Then P(B) is

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

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

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

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

Answer:

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16. If $\vec{a}, \vec{b}$ are the position vectors A and B then which one of the following points whose position vector lies on AB, is

A. $\frac{2\vec{a} + \vec{b}}{3}$

B. $\frac{\vec{a} - \vec{b}}{3}$

C. $\vec{a} + \vec{b}$

D. $\frac{2\vec{a} - \vec{b}}{2}$

Answer:

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17. If $|x + 2| \leq 8$, then x belongs to?

A. (6, 10)

B. (-10, 6)

C. [6, 10]

D. [-10, 6]

Answer:

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18. The expansion of $(1-x)^{-2}$ is?

A. $1-x+x^2-....$

B. $1+x+x^2+....$

C. $1-2x+3x^2-....$

D. $1+2x+3x^2+....$

Answer:

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19. If : $R \to R$ is defined by f(x) = |x| - 5, then the range of f is :

A. $(-\infty, -5)$

B. $(-\infty, 5)$

C. $[-5, \infty)$

D. $(-5, \infty)$

Answer:

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20. Which one of the following is not true about the matrix $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 5 \end{pmatrix}$?

A. an upper triangular matrix

B. a lower triangular matrix

C. a scalar matrix

D. a diagonal matrix

Answer:

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Section Ii

1. Write the use of horizontal line test.

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2. Write the relationship between Permutation and Combination?

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3. Count the number of positive integers greater than 6000 and less than 7000 which are divisible by 5, provided that no digits are repeated?

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4. Find the separate equations from a combined equation of a straight line $2x^2 + xy - 3y^2 = 0$

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5. Define diagonal and scalar matrices?

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6. Find a unit vector along the directions of the vector $5\hat{i} - 3\hat{j} + 4\hat{k}$?

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7. Define a continuous function on the closed interval [a,b]

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8. Consider the function $f(x) = \sqrt{x}, x \geq 0$. Does $\lim_{x \to 0} f(x)$ exist?

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9. An integer is chosen at random from the first ten positive integers.Find the probability that it is a multiple of three?

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10. Is it correct to say $A \times A = \{(a, a) : a \in A\}$? Justify your answer.

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Section Iii

1. A football player can kick a fotball from ground level with an initial velocity (u) of 80 ft/second. Find the maximum horixzontal distance the football travels and at what angle

(Take $R = \frac{u^2 \sin 2\alpha}{g}$, and $g = 32$)

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2. Find the coefficient of x^3 in the expansion of $(2 - 3x)^7$?

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3. Find the nearest point on the line x - 2y- 5 from the origin.

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4. Prove that square matrix can be expressed as the sum of a symmetric matrix and a skew-symmetric matrix.

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5. If $\vec{a}, \vec{b}, \vec{c}$ are three vectors such that $\vec{a} + 2\vec{b} + \vec{c} = \vec{0}$ and $\left|\vec{a}\right| = 3, \left|\vec{b}\right| = 4, \left|\vec{c}\right| = 7$, find the angle between $\vec{a}$ and $\vec{b}$.

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6. Examine the continuity of the following :

$\cot x + \tan x$

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7. Find $\frac{dy}{dx}$ in the following :

$y = \sin^1\left(\frac{1-x^2}{1+x^2}\right), 0 < x < 1.$

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8. Find $\frac{dy}{dx}$ if x =a (t-sint),y=a(1-cos t)?

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9. Evaluate: $\int (x-3)\sqrt{x+2}dx.$

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10. Construct a suitable domain X such that f: $X \to N$ defined by f(n) = n + 3 to be one to one and onto.

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Section Iv

1. For the given base curve $y = \sin x$ draw $y = \frac{1}{2}\sin 2x$

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2. Write any five different forms of an equation of a straight line.

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3. Solve the equation $\sqrt{6 - 4x - x^2}$ = x + 4

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4. Do the limits of following functions exists as $x \to 0$? State reason for your answer.

$$\frac{\sin(x - \lfloor x \rfloor)}{x - \lfloor x \rfloor}$$

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5. Evaluate, $\int \frac{2x + 4}{x^2 + 4x + 6}$

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6. Prove that $\sqrt[3]{x^3 + 7} - \sqrt[3]{x^3 + 4}$ is approximately equal to $\frac{1}{x^2}$ when x is large.

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7. Find the unit vectors perpendicular to each of the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$,where $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$.

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8. Find $\frac{d^2y}{dx^2}$ if $x^2 + y^2 = 4$

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9. The chances of X, Y and Z becoming managers of a certain company are 4 : 2 : 3. The probabilities that bonus scheme will be introduced if X, Y and Z become managers are 0.3, 0.5 and 0.4 respectively. If the bonus scheme has been introduced, what is the probability that Z was appointed as the manager?

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10. Prove that $\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} = (x-y)(y-z)(z-x)$

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11. Evaluate ∫(x^2+x+1)/√x dx .

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