doubtnut
India's Number 1 Education App

MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

SAMPLE PAPER - 3

Part I

1. Let A and B be subsets of the universal set N, the set of natural numbers. Then $A' \cup [(A \cap B) \cup B']$ is ..... .

A. A

B. A'

C. B

D. N

Answer: D

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2. $(A - B) \cup (B - A) =$

A. $(A - B) \cup A$

B. $(B - A) \cup B$

C. $(A \cup B) - (A \cap B)$

D. $(A \cup B) \cap (A \cap B)$

Answer: C

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3. The equations whose roots are numerically equal but opposite in sign to the roots of $3x^2 - 5x - 7 = 0$ is ..... .

A. $3x^2 - 5x - 7 = 0$

B. $3x^2 + 5x - 7 = 0$

C. $3x^2 - 5x + 7 = 0$

D. $3x^2 + x - 7 = 0$

Answer: B

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4. The value of $\sin(45^\circ + \theta) - \cos(45^\circ - \theta)$ is .....

A. $2\cos\theta$

B. 1

C. 0

D. $2\sin\theta$

Answer: C

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5. If $\tan\alpha$ and $\tan\beta$ are the roots of $x^2 + ax + b = 0$ then $\frac{\sin(\alpha+\beta)}{\sin\alpha\sin\beta}$ is equal to ..... .

A. $\frac{b}{a}$

B. $\frac{a}{b}$

C. $-\frac{a}{b}$

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

Answer: C

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6. If ${}^{a^2-a}C_2 = {}^{a^2-a}C_4$ then the value of a is ..... .

A. 2

B. 3

C. 4

D. 5

Answer: B

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7. If ${}^nP_r = 840, {}^nC_r = 35$ then $r =$ ..... .

A. 7

B. 6

C. 5

D. 4

Answer:

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8. If $2x^2 + 3xy - cy^2 = 0$ represents a pair of perpendicular lines then $c =$ ..... .

A. -2

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

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

D. 2

Answer: D

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9. If the n^{th} term of an A.P is $2n-1$ then sum to n terms of that A.P. is ..... .

A. n^2

B. n^2+1

C. $2n-1$

D. $n^2 - 1$

Answer: A

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10. If $A = \begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix}, B = \begin{pmatrix} a & 1 \\ b & -1 \end{pmatrix}$ and $(A+B)^2 = A^2 + B^2$ then the values of a and b are ..... .

A. $a = 4, b = 1$

B. $a = 1, b = 4$

C. $a = 0, b = 4$

D. $a = 2, b = 4$

Answer: B

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11. If the points $(x, -2)(5, 2), (8, 8)$ are collinear then x is equal to ..... .

A. -3

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

C. 1

D. 3

Answer: D

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12. In a regular hexagon ABCDEF if $\overrightarrow{AB}$ and $\overrightarrow{BC}$ are represented by $\vec{a}$ and $\vec{b}$ respectively then $\overrightarrow{EF} =$ ..... .

A. $\vec{a} - \vec{b}$

B. $\vec{a}$

C. $-\vec{b}$

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

Answer: C

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13. If $\left|\vec{a} + \vec{b}\right| = 60, \left|\vec{a} - \vec{b}\right| = 40$ and $\left|\vec{b}\right| = 46$, then $\left|\vec{a}\right|$ is ..... .

A. 42

B. 12

C. 22

D. 32

Answer: C

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14. For $\vec{a} = \hat{i} + \hat{j} - 2\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = \hat{i} - 2\hat{j} + 2\hat{k}$, then find the unit vector parallal to $\vec{a} + \vec{b} + \vec{c}$ is ..... .

A. $\frac{\hat{i} + \hat{j} - \hat{k}}{\sqrt{3}}$

B. $\frac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{3}}$

C. $\frac{\hat{i}+\hat{j}+\hat{k}}{3}$

D. $\frac{\hat{i}-\hat{j}+\hat{k}}{\sqrt{6}}$

Answer: B

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15. The differential coefficient of $\log_{10} x$ with respect to $\log_x 10$ is

A. 1

B. $-(\log_{10} x)^2$

C. $(\log_x 10)^2$

D. $\frac{x^2}{100}$

Answer: B

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16. $\frac{d}{dx}\left(e^{x+5\log x}\right)$ is ..... .

A. $e^x x^4(x+5)$

B. $e^x x(x+5)$

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

D. $e^x - \frac{5}{x}$

Answer: A

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17. If $f(x) = x\tan^{-1}x$, then $f'(1)$ is

A. $1 + \frac{\pi}{4}$

B. $\frac{1}{2} + \frac{\pi}{4}$

C. $\frac{1}{2} - \frac{\pi}{4}$

D. 2

Answer: B

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18. $\int \cos ecx dx = \ldots\ldots\ldots\ldots\ldots\ldots .$

A. $\log \tan. \frac{x}{2} + c$

B. $-\log(\cos ecx + \cot x) + c$

C. $\log(\cos ecx - \cot x) + c$

D. all of them

Answer: D

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19. If A and B are two events such that $A \subset B$ and $P(B) \neq 0$, then which of the following is correct ?

A. $P(A/B) = \dfrac{P(A)}{P(B)}$

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

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

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

Answer: C

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20. A number x is chosen at random from the set $\{1, 2, 3, 4, \ldots\ldots\ldots, 100\}$. Defind the event : A = the chosen number x satisfies $\frac{(x-10)(x-50)}{(x-30)} \geq 0$, then P(A) is

A. 0.20

B. 0.51

C. 0.71

D. 0.70

Answer: C

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Part Ii

1. Write the value of f at $-4, 1, -2, 7, 0$ if

$$f(x) = \begin{cases} -x+4 & \text{if } -\infty < x \leq -3 \\ x+4 & \text{if } -3 < x < -2 \\ x^2 - x & \text{if } -2 \leq x < 1 \\ x - x^2 & \text{if } 1 \leq x < 7 \\ 0 & \text{otherwise} \end{cases}$$

A.

B.

C.

D.

Answer: $f(0) = 0$

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2. Solve: $23x < 100$ when (i) x is a natural number (ii) x is an integer

A.

B.

C.

D.

Answer: (i) $x = 1, 2, 3, 4 (x \in N)$

(ii) $x = ... -3, -2, -1, 0, 1, 2, 3, 4 (x \in Z)$

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3. Expand $\frac{1}{5+x}$ in ascending powers of x.

A.

B.

C.

D.

Answer: $= \frac{1}{5} - \frac{x}{5^2} + \frac{x^2}{5^3} - \frac{x^3}{5^4} \ldots.$

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4. Find the nearest point on the line $2x + y = 5$ from the origin.

A.

B.

C.

D.

Answer: Hence the nearest point on the line from the origin is (2, 1).

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5. Determine $3B + 4C - D$ if B, C and D are given by

$$B = \begin{pmatrix} 2 & 3 & 0 \\ 1 & -1 & 5 \end{pmatrix}, C = \begin{pmatrix} -1 & -2 & 3 \\ -1 & 0 & 2 \end{pmatrix}, D = \begin{pmatrix} 0 & 4 & -1 \\ 5 & 6 & -5 \end{pmatrix}$$

A.

B.

C.

D.

Answer: $\begin{bmatrix} 2 & -3 & 13 \\ -6 & -9 & 28 \end{bmatrix}$

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6. Find the constant b that makes g continuous on $(-\infty, \infty), g(x) = \begin{cases} x^2 - b^2, \text{if } x < 4 \\ bx + 20, \text{if } x \geq 4 \end{cases}$

A.

B.

C.

D.

Answer: $b = -2$

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7. Find $\frac{dy}{dx}$ if $x^2 + y^2 = 1$

A.

B.

C.

D.

Answer: $\frac{dy}{dx} = -\frac{x}{y}$

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8. Evaluate $\int \frac{1}{\sin^2 x \cos^2 x} dx.$

A.

B.

C.

D.

Answer: $\tan x - \cot x + c$

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9. If $P(A) = 0.5, P(B) = 0.8$ and $P(B/A) = 0.8$ find $P(A/B)$ and $P(A \cup B)$

A.

B.

C.

D.

Answer: So, $P(A/B) = 0.5$ **and** $P(A \cup B) = 0.9$

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10. find the angle between the vectors $2\hat{i} + \hat{j} - \hat{k}$ and $\hat{i} + 2\hat{j} + \hat{k}$ using vector product.

A.

B.

C.

D.

Answer: $\therefore \theta = \pi/3$

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Part Iii

1. If $\left(x^{1/2}+x^{-1/2}\right)^2=\frac{9}{2}$ find the value of $\left(x^{1/2}-x^{-1/2}\right)$ for $x>1$

A.

B.

C.

D.

Answer: $\frac{1}{\sqrt{2}}$

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2. If $\frac{n!}{3!(n-4)!}$ and $\frac{n!}{5!(n-5)!}$ are in the ratio $5:3$ find the value of n.

A.

B.

C.

D.

Answer: $n = 16$

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3. Expand $(1+x)^{2/3}$ up to four terms for $|x| < 1$.

A.

B.

C.

D.

Answer: Thus, $(1+x)^{2/3} = 1 + \frac{2}{3}x - \frac{1}{9}x^2 + \frac{4}{81}x^3 + \ldots$

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4. Find the equation of the line if the perpendicular drawn from the origin makes an angle 30° with x axis and its length is 12.

A.

B.

C.

D.

Answer:

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

A.

B.

C.

D.

Answer:

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6. Find $\lim_{t \to 0} \dfrac{\sqrt{t^2 + 9} - 3}{t^2}$

A.

B.

C.

D.

Answer: $\dfrac{1}{6}$

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7. Evaluate: $\int \sec^3 2x dx$

A.

B.

C.

D.

Answer: $1 = \frac{1}{4}[\sec 2x \tan 2x + \log(\sec 2x + \tan 2x)] + c$

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8. Evaluate $\int \left(5x^2 - 4 + \frac{7}{x} + \frac{2}{\sqrt{x}}\right) dx$

A.

B.

C.

D.

Answer: $\frac{5}{3}x^3 - 4x + 7\log x + 4\sqrt{x} + c$

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9. What is the chance that leap year should have fifty three Sundays ?

A.

B.

C.

D.

Answer: So, $P(A) = \frac{2}{7}$

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10. Solve: $\frac{x+1}{x-1} > 0$

A.

B.

C.

D.

Answer: $\Rightarrow x \in (-\infty, -1) \cup (1, \infty)$

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Part Iv

1. Solve the following equation and find the value of θ.

$\sqrt{3}\sin\theta - \cos\theta = \sqrt{2}.$

A.

B.

C.

D.

Answer: Thus, $\theta = n\pi + \frac{\pi}{6} \pm (-1)^n \frac{\pi}{4}, n \in \mathbb{Z}$

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2. Solve: $\frac{x^2 - 4}{x^2 - 2x - 15} \leq 0$

A.

B.

C.

D.

Answer: So the solution for the inequality $\frac{x^2-4}{x^2-2x-15} \leq 0$ **are** $(-3, -2) \cup (2, 5)$

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3. Differentiate the following:

$$y = \sqrt{x + \sqrt{x + \sqrt{x}}}$$

A.

B.

C.

D.

Answer: $\dfrac{4\sqrt{x}\sqrt{x+\sqrt{x}}+2\sqrt{x}+1}{8\sqrt{x}\sqrt{x+\sqrt{x}}\sqrt{x\sqrt{x+\sqrt{x}}}}$

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4. Evaluate $\lim_{x \to \infty} x\left[3^{\frac{1}{x}}+1-\cos\left(\frac{1}{x}\right)-e^{\frac{1}{x}}\right]$

A.

B.

C.

D.

Answer: $\log 3 - 1$

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

A.

B.

C.

D.

Answer:

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6. Differentiate $y=\sin\left(\tan\left(\sqrt{\sin x}\right)\right)$

A.

B.

C.

D.

Answer: $\dfrac{\cos\left(\tan\sqrt{\sin x}\right)\sec^2\left(\sqrt{\sin x}\right)\cos x}{2\sqrt{\sin x}}$

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7. Given $P(A) = 0.4$ and $P(A \cup B) = 0.7$. Find $P(B)$ if

(i) A and B are mutually exclusive

(ii) A and B are independent events

$(iii) P(A/B) = 0.4$

$(iv) P(B/A) = 0.5$

A.

B.

C.

D.

Answer: (b) (i) $P(B) = 0.3 \quad (\text{ii}) 0.5 \quad (\text{iii}) 0.5 \quad (\text{iv}) 0.5$

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