MATHS

BOOKS - KVPY PREVIOUS YEAR

MOCK TEST 6

Exercise

1. $\lim_{x \to 2} \left(\frac{\sqrt{1 - \cos\{2(x-2)\}}}{x-2} \right)$

A. equals $\sqrt{2}$

B. equals $-\sqrt{2}$

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

D. does not exist

Answer:

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2. If POR is the triangle formed by the common tangents to the circles $x^2 + y^2 + 6x = 0$ and $x^2 + y^2 - 2x = 0$, then the centroid of the triangle is at the point (a) (1,0) (b) (0, 0) (c) (-1,0) (d) none of these

A. centroid of ΔPQR is (1,0)

B. incentre of the ΔPQR is(1,0)

C. circumcenter of the ΔPQR is (1, 0)

D. orthocenter of the ΔPQR is(2, 0)

Answer:

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3. Let f(x) be a continuous function, $\forall x \in R, f(0) = 1$ and $f(x) \neq x$ for any $x \in R$, then show $f(f(x)) > x, \forall x \in R^+$

A. f(f(x))=x for some x $\in$ R

B. $f(f(x)) > x \, \forall x \in R$

C. $f(f(x)) < x \, \forall x \in R$

D. None of these

Answer:

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4. An eppipse of eccentricity $\frac{2\sqrt{2}}{3}$ is inscribed in a circle and a point within the circle is chosen at random. The probability that this point lies outside the ellipse is

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

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

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

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

Answer:

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5. $\sin^{-1}(\sin 5) > x^2 - 4x$ holds if

A. $x < 2 - \sqrt{9 - 2\pi}$

B. $-1 < x < 5$

C. $x \in (-\infty, -1) \cup (5, \infty)$

D. $x \in \left(2 - \sqrt{9 - 2\pi}, 2 + \sqrt{9 - 2\pi}\right)$

Answer:

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6. A is one of the 6 horses entered for a race and is to be ridden by one of two jockeys B and C. It is 2 to 1 that B rides A, in which case all the horses are equally likely to win. If C rides A, his chance is trebled what are the odds against his winning

A. $2:1$

B. $3:2$

C. $1:2$

D. $2:3$

Answer:

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7. Let coordinates of the points A and B are (5, 0) and (0, 7) respectively. P and Q are the variable points lying on the x- and y-axis respectively so that PQ is always perpendicular to the line AB. Then locus of the point of intersection of BP and AQ is

A. $x^2 + y^2 - 5x + 7y = 0$

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

C. $x2 + y2 + 5x + 7y = 0$

D. $x2 + y2 - 5x - 7y = 0$

Answer:

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8. If $\cos 3x + \sin\left(2x - \frac{7\pi}{6}\right) = -2$, then x =

A. $\frac{\pi}{3}(6m - 1)$

B. $\frac{\pi}{3}(6m + 1)$

C. $\frac{\pi}{3}(2m + 1)$

D. None of these

Answer:

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9. Solve

$$\log_3(x+2)(x+4) + \log_{1/3}(x+2) < \frac{1}{2}\log_{\sqrt{3}} 7.$$

A. (-2,-1)

B. (-2,3)

C. (-1,3)

D. $(3, \infty)$

Answer:

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10. If $k \in I$ such that $\lim_{n \to \infty} \left(\cos. \frac{k\pi}{4}\right)^{2n} - \left(\cos. \frac{k\pi}{6}\right)^{2n} = 0,$ then

A. k must not be divisible by 24

B. k is divisible by 24 or k is divisible neither by 4 nor by 6

C. k must be divisible by 12 but not necessarily by 24

D. None of these

Answer:

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11. On the set N of all natural numbers define the rational R by aRb iff the G.C.D. of a and b is 2. Then R is

A. reflexive, but not symmetric

B. symmetric only

C. reflexive and transitive

D. not reflexive, not symmetric, not transitive

Answer:

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12. Prove that for $n = 1, 2, 3...$

$$\left[\frac{n+1}{2}\right] + \left[\frac{n+2}{4}\right] + \left[\frac{n+4}{8}\right] + \left[\frac{n+8}{16}\right] + ... = n$$

where $[x]$ represents Greatest Integer Function

A. $n - 1$

B. n

C. $n + 2$

D. 2n

Answer:

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13. The system of homogenous equations

$tx + (t+1)y + (t-1)z = 0,$

$(t+1)x + ty + (t+2)z = 0,$

$(t-1)x + (t+2)y + tz = 0$ has a non trivial solution for

A. three values of t

B. two values of t

C. one value of t

D. no value of t

Answer:

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14. Let $f(x) and g(x)$ be bijective functions where $f: \{1, b, c, d\} \overrightarrow{1, 2, 3, 4} and g: \{3, 4, 5, 6\} \overrightarrow{2, x, y, z}$, respectively. Then, find the number of elements in the range of $g(f(x)\}$.

A. 1

B. 2

C. 3

D. 4

Answer:

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15. Let ω be a complex cube root unity with $\omega \neq 1$. A fair die is thrown three times. If $r_1, r_2 and r_3$ are the numbers obtained on the die, then the probability that $\omega^{r1} + \omega^{r2} + \omega^{r3} = 0$ is $1/18$ b. $1/9$ c. $2/9$ d. $1/36$

A. $1/18$

B. $1/9$

C. $2/9$

D. $1/36$

Answer:

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16. Let $I = \int_{\pi/4}^{\pi/3} \frac{\sin x}{x} dx$, then I belongs to

A. $\left(\frac{\sqrt{3}}{8}, \frac{\sqrt{2}}{6} \right)$

B. $\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{3}}{2} \right)$

C. $\left(\frac{1}{2}, \frac{\sqrt{2}}{2} \right)$

D. None of these

Answer:

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17. The area between the curves $y = 2x^4 - x^2$, the x-axis and the ordinates of two minima of the be curve is (A) $\frac{7}{240}$ (B) $\frac{7}{120}$ (C) $\frac{7}{60}$ (D) None of these

A. $\frac{7}{120}$

B. $\frac{9}{120}$

C. $\frac{11}{120}$

D. $\frac{13}{120}$

Answer:

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18. $f(x) = \begin{cases} 2 - & |x^2, +, 5x, +, 6|, & x \neq -2 \\ a^2 & +1, & x = -2 \end{cases}$

,then the range of a, so

that f(x) has maxima at x=-2 is

A. $|a| \geq 1$

B. $|a| < 1$

C. agt1

D. alt 1

Answer:

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19. If f is the centre of a circle inscribed in a triangle ABC, then $\left|\overrightarrow{BC}\right|\overrightarrow{IA}+\left|\overrightarrow{CA}\right|\overrightarrow{IB}+\left|\overrightarrow{AB}\right|\overrightarrow{IC}$ is

A. zero

B. $\dfrac{\overrightarrow{IA}+\overrightarrow{IB}+\overrightarrow{IC}}{3}$

C. $3\left(\overrightarrow{IA}+\overrightarrow{IB}+\overrightarrow{IC}\right)$

D. None of these

Answer:

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20. The number of numbers, that can be formed by using all digits 1,2, 3, 4, 3,2,1 so that odd digits always occupy odd places, is

A. 18

B. 34

C. 30

D. 12

Answer:

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21. If sum of two numbers is 3, then maximum value of the product of first and the square of second is

A. 4

B. 3

C. 2

D. 1

Answer:

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22. Suppose that f is a differentiable function with the property that $f(x+y)=f(x)+f(y)+xy$ and $\lim_{h\to 0}\frac{1}{h}f(h)=3$, where [.] represents greatest integer function, then

A. f is a linear function

B. $f(x)=3x+x^2$

C. $f(x)=3x+\frac{x^2}{2}$

D. None of these

Answer:

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23. consider the expression $3^{\sin^6 x} + 3^{\cos^6 x}$ find the minimum value.

A. $2.3^{1/8}$

B. $2.3^{7/8}$

C. $3.2^{1/8}$

D. 6

Answer:

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