MATHS

BOOKS - MTG MATHS (BENGALI ENGLISH)

QUESTION PAPER 2008

Multiple Choice Questions

1. The number of ways four boys can be seated around a round-table in four chairs of different colours is

A. 24

B. 12

C. 23

D. 64

Answer:

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2. If one root of the equation $x^2 + (1 - 3i)x - 2(1 + i) = 0$ is $-1 + i$, then the other root is

A. $-1 - i$

B. $\frac{(-1 - i)}{2}$

C. i

D. 2i

Answer:

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3. Three sets A, B, C are such that $A = B \cap C$ and $B = C \cap A$, then

A. $A \subset B$

B. $A \supset B$

C. $A \equiv B$

D. $A \subset B'$

Answer:

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4. The sum of the infinite series $\left(\frac{1}{3}\right)^2 + \frac{1}{3}\left(\frac{1}{3}\right)^4 + \frac{1}{5}\left(\frac{1}{3}\right)^6 + \ldots\ldots$ is

A. $\frac{1}{4}\log_e 2$

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

C. $\frac{1}{6}\log_e 2$

D. $\frac{1}{4}\log_e \frac{3}{2}$

Answer:

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5. The values of x for which the given matrix $\begin{bmatrix} -x & x & 2 \\ 2 & x & -x \\ x & -2 & -x \end{bmatrix}$ will be non-singular are

A. $-2 \leq x \leq 2$

B. for all x other than 2 and -2

C. $x \geq 2$

D. $x \leq -2$

Answer:

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6. If $\tan\left(\frac{\alpha\pi}{4}\right) = \cot\left(\frac{\beta\pi}{4}\right)$, then n is an integer.

A. $\alpha + \beta = 0$

B. $\alpha + \beta = 2n$

C. $\alpha + \beta = 2n + 1$

D. $\alpha + \beta = 2(2n + 1)$

Answer:

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7. The principal value of $\sin^{-1}\left(\tan\left(-\frac{5\pi}{4}\right)\right)$ is

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

B. $-\frac{\pi}{4}$

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

D. $-\frac{\pi}{2}$

Answer:

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8. The value of $\cos\frac{\pi}{15}\cos\frac{2\pi}{15}\cos\frac{4\pi}{15}\cos\frac{8\pi}{15}$ is

A. $\frac{1}{16}$

B. $-\frac{1}{16}$

C. 1

D. 0

Answer:

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9. If a, b, c be in Arithmetic progression, then, then value of $(a+2b-c)(2b+c-a)(a+2b+c)$ is

A. 16abc

B. 4abc

C. 8abc

D. 3abc

Answer:

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10. The equation $x^2-3|x|+2=0$ has

A. No real root

B. One real root

C. Two real roots

D. Four real roots

Answer:

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11. The principal amplitude of $(\sin 40^\circ + i\cos 40^\circ)^5$ is

A. 70°

B. -110°

C. 110°

D. -70°

Answer:

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12. If $\log_5 \log_5 \log_2 x = 0$ then value of x is

A. 32

B. 125

C. 625

D. 25

Answer:

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13. A person draws out two balls successively from a bag containing 6 red and 4 white balls. The probability that at least one of them will be red is

A. $\frac{78}{90}$

B. $\frac{30}{90}$

C. $\frac{48}{90}$

D. $\frac{12}{90}$

Answer:

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14. If three real numbers a, b, c are in Harmonic Progression, then which of the following is true?

A. $\frac{1}{a}, b, \frac{1}{c}$ are in A.P.

B. $\frac{1}{bc}, \frac{1}{ca}, \frac{1}{ab}$ are in H.P.

C. ab, bc, ca are in H.P.

D. $\frac{a}{b}, \frac{b}{c}, \frac{c}{a}$ are in H.P.

Answer:

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15. A mappin $f: N \to N$ where N is the set of natural numbers is defined as

$f(n) = n^2$ for n odd

$f(n) = 2n + 1$ for n even

for $n \in N$.

Then f is

A. Surjective but not injective

B. Injective but not surfective

C. Bijective

D. Neither injective nor surjective

Answer:

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16. If the magnitude of the coefficient of x^7 in the expansion of $\left(ax^2 + \frac{1}{bx}\right)^8$, where a, b are positive numbers, is equal to the magnitude of the coefficient of x^{-7} in the expansion of $\left(ax - \frac{1}{bx^2}\right)^8$, then a and b are connected by the relation

A. $ab = 1$

B. $ab = 2$

C. $a^2b = 1$

D. $ab^2 = 2$

Answer:

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17. The mapping $f: N \to N$ given by $f(n) = 1 + n^2, n \in N$ where N is the set of natural numbers, is

A. One to one and onto

B. Onto but not one-to-one

C. One-to-one but not onto

D. Neither one-to-one nor onto

Answer:

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18. A and B are two points on the Argand plane such that the segment AB is bisected at the point (0, 0). If the point A, which is in the third quadrant has principal amplitude θ, then the principal amplitude of the point B is

A. $-\theta$

B. $\pi - \theta$

C. $\theta - \pi$

D. $\pi + \theta$

Answer:

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19. A function $f: A \to B$, where $A = \{x: -1 \leq x \leq 1\}$ and $B = \{y/1 \leq y \leq 2\}$ is defined by the rule $y = f(x) = 1 + x^2$. Which of the following statements is then true?

A. f is injective but not surjective

B. f is surjective but not injective

C. f is both injective and surjective

D. f is neither injective nor surjective

Answer:

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20. The function f(x) which satisfies $f(x) = f(-x) = \frac{f'(x)}{x}$ is given by

A. $f(x) = \frac{1}{2}e^{x^2}$

B. $f(x) = \frac{1}{2}e^{-x^2}$

C. $f(x) = x^2 e^{x^2/2}$

D. $f(x) = e^{x^2/2}$

Answer:

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21. A function f(x) is defined as follows for real x

$$f(x) = \begin{cases} 1 - x^2 & , \text{for x} < 1 \\ 0 & , \text{for x} = 1 \\ 1 + x^2 & , \text{for x} > 1 \end{cases}$$

Then

A. f(x) is not continuous at x = 1

B. f(x) is continuous but not differentiable at x = 1

C. f(x) is both continuous and differentiable at x = 1

D. f(x) is continuous everywhere but differentiable nowhere

Answer:

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22. Select the correct statement from (A), (B), (C), (D). The function $f(x) = xe^{1-x}$

A. strictly increases in the interval $\left(\frac{1}{2}, 2\right)$

B. increases in the interval $(0, \infty)$

C. decreases in the interval (0, 2)

D. strictly decreases in the interval $(1, \infty)$

Answer:

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23. The equation $e^x + x - 1 = 0$ has, apart from x = 0

A. One real root

B. Two real roots

C. No other real root

D. Infinite number of real roots

Answer:

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24. The function $f(x) = e^{ax} + e^{-ax}, a > 0$ is monotonically increasing for

A. $-1 < x < 1$

B. $x < -1$

C. $x > -1$

D. $x > 0$

Answer:

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25. Find the following:

$$\int \frac{1}{x(x^7+1)} dx$$

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26. If ${}^{16}C_r = {}^{16}C_{r+1}$ then the value of ${}^{r}P_{r-3}$ is

A. 31

B. 120

C. 210

D. 840

Answer:

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27. The coefficient of x^{-10} in $\left(x^2 - \frac{1}{x^3}\right)^{10}$ is

A. -252

B. 210

C. $-(51)$

D. -120

Answer:

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28. If the matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is commutative with the matrix $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ then

A. $a = 0, b = c,$

B. $b = 0, c = d$

C. $c = 0, d = a$

D. $d = 0, a = b$

Answer:

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29. If $1, \omega, \omega^2$ are cube roots of unity, then $\begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^{2n} & 1 & \omega^n \\ \omega^n & \omega^{2n} & 1 \end{vmatrix}$ has value

A. 0

B. ω

C. ω^2

D. $\omega + \omega^2$

Answer:

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30. Let $A = \{1, 2, 3\}$ and $B = \{2, 3, 4\}$, then which of the following relations is a function from A to B?

A. $\{(1, 2), (2, 3), (3, 4), (2, 2)\}$

B. $\{(1, 2), (2, 3), (1, 3)\}$

C. $\{(1, 3), (2, 3), (3, 3)\}$

D. $\{(1, 1), (2, 3), (3, 4)\}$

Answer:

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31. One possible condition for the three points $(a, b), (b, a)$ and $(a^2, -b^2)$ to be collinear is.

A. $a - b = 2$

B. $a + b = 2$

C. $a = 1 + b$

D. $a = 1 - b$

Answer:

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32. If the m^{th} term and the n^{th} term of an A.P. are respectively $\frac{1}{n}$ and $\frac{1}{m}$, then the $(mn)^{th}$ term of the A.P. is

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

B. $\frac{m}{n}$

C. 1

D. $\frac{n}{m}$

Answer:

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33. Find the following:

$$\int_1^4 |x-2|dx$$

A. $\frac{1}{20}$

B. 20

C. 0

D. $\frac{1}{330}$

Answer:

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34. Find $\int_0^{\frac{\pi}{2}} \log \tan x dx$

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35. Find $\int \frac{1}{\sqrt{2x - x^2}} dx$

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36. If $h(x) = \frac{x^3 - a^3}{x - a}$, then find h(a).

A. $\frac{h(x)}{h(\pi)}$

B. $h(x)h(\pi)$

C. $h(x) - h(\pi)$

D. $h(x) + h(\pi)$

Answer:

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37. The value of $\left(1 - \omega + \omega^2\right)^5 + \left(1 + \omega - \omega^2\right)^5$, where ω and ω^2 are the complex cube roots of unity is

A. 0

B. 32ω

C. -32

D. 32

Answer:

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38. The degree of the differential equation $\left[1+\left(\frac{dy}{dx}\right)^2\right]^{5/3} = \frac{d^2y}{dx^2}$ is

A. 1

B. 5

C. $\frac{10}{3}$

D. 3

Answer:

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39. The differential equation of all parabolas whose axes are parallel to y-axis is

A. $\frac{d^3y}{dx^3} = 0$

B. $\frac{d^2y}{dx^2} = 0$

C. $\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$

D. $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = 0$

Answer:

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40. The solution of the differential equation $\frac{dy}{dx} = e^{y+x} + e^{y-x}$ is

A. $e^{-y} = e^x - e^{-x} + c$, c integrating constant

B. $e^{-y} = e^{-x} - e^x + c$, integrating constant

C. $e^{-y} = e^x + e^{-x} + c$, c integrating constant

D. $e^{-y} + e^x + e^{-x} = c$, c integrating constant

Answer:

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41. The value of the integral $\int_0^2 |x^2 - 1| dx$ is

A. 0

B. 2

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

D. -2

Answer:

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42. If $x = e^t \sin t, y = e^t \cos t$ then $\frac{dy}{dx}$ at $t = \pi$ is

A. $2e^{\pi}$

B. $\frac{1}{2}e^{\pi}$

C. $\frac{1}{2e^{\pi}}$

D. $\frac{2}{e^{\pi}}$

Answer:

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43. The value of $\frac{dy}{dx}$ at $x = \frac{\pi}{2}$, where y is given by $y = x^{\sin x} + \sqrt{x}$ is

A. $1 + \frac{1}{\sqrt{2\pi}}$

B. 1

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

D. $1 - \frac{1}{\sqrt{2\pi}}$

Answer:

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44. The value of $\int_0^{\pi} |\cos x| dx$ is

A. 2π

B. 2

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

D. π

Answer:

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45. The value of $\int_{-3}^{3} \left(ax^5 + bx^3 + cx + k\right) dx$, where a, b, c, k are constants, depends only on

A. a and k

B. a and b

C. a, b and c

D. k

Answer:

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46. The value of the integral $\int_{-a}^{a} \frac{xe^{x^2}}{1+x^2} dx$ is

A. e^{a^2}

B. 0

C. e^{-a^2}

D. a

Answer:

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47. The value of the limit $\lim_{n \to \infty} \left(\frac{1}{n+1} + \frac{1}{n+2} + \ldots\ldots + \frac{1}{6n} \right)$ is

A. log 2

B. log 6

C. 1

D. log 3

Answer:

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48. The order and degree of the following differential equation $\left[1 + \left(\frac{dy}{dx} \right)^2 \right]^{5/2} = \frac{d^3y}{dx^3}$ are respectively

A. 3, 2

B. 3, 10

C. 2, 3

D. 3, 5

Answer:

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49. The differential equation of the family of circles passing through the fixed points (a, 0) and (-a, 0) is

A. $y_1\left(y^2 - x^2\right) + 2xy + a^2 = 0$

B. $y_1y^2 + xy + a^2x^2 = 0$

C. $y_1\left(y^2 - x^2 + a^2\right) + 2xy = 0$

D. $y_1\left(y^2 + x^2\right) - 2xy + a^2 = 0$

Answer:

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50. The differential equation of the family of curves $y = e^{2x}(a\cos x + b\sin x)$, where a and b are arbitrary constants, is given by

A. $y_2 - 4y_1 + 5y = 0$

B. $2(y_2 - y_1) + 5y = 0$

C. $y_2 + 4y_1 - 5y = 0$

D. $y_2 - 2y_1 + 5y = 0$

Answer:

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51. $Lt_{x \to \frac{\pi}{2}} \dfrac{a^{\cot x} - a^{\cos x}}{\cot x - \cos x}, a > 0$

A. $= \log_e \frac{\pi}{2}$

B. $= \log_e 2$

C. $= \log_e a$

D. $= a$

Answer:

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52. Rolle's theorem is not applicable to the function $f(x) = |x|$ for $-2 \leq x \leq 2$ because

A. f is continuous for $-2 \leq x \leq 2$

B. f is not derivable for x = 0

C. $f(-2) = f(2)$

D. f is not a constant function

Answer:

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53. The equation of the circle which passes through the points of intersection of the circles $x^2 + y^2 - 6x = 0$ and $x^2 + y^2 - 6y = 0$, and has its centre at $\left(\frac{3}{2}, \frac{3}{2}\right)$ is

A. $x^2 + y^2 + 3x + 3y + 9 = 0$

B. $x^2 + y^2 + 3x + 3y = 0$

C. $x^2 + y^2 - 3x - 3y = 0$

D. $x^2 + y^2 - 3x - 3y + 9 = 0$

Answer:

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54. If $2y = x$ and $3y + 4x = 0$ are the equations of a pair of conjugate diameters of an ellipse, then the eccentricity of the ellipse is

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

B. $\sqrt{\frac{2}{5}}$

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

D. $\sqrt{\frac{1}{2}}$

Answer:

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55. The area enclosed between the curve $y = 1 + x^2$, the y-axis, and the straight line $y = 5$ is given by

A. $\frac{14}{3}$ square units

B. $\frac{7}{3}$ square units

C. 5 square units

D. $\frac{16}{3}$ square units

Answer:

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56. If t is a parameter, then $x = a\left(t + \frac{1}{t}\right), y = b\left(t - \frac{1}{t}\right)$ represents

A. An ellipse

B. A circle

C. A pair of straight lines

D. A hyperbola

Answer:

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57. The line which is parallel to x-axis and crosses the curve $y = \sqrt{x}$ at an angle 45° is

A. $y = \frac{1}{4}$

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

C. $y = 1$

D. $y = 4$

Answer:

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58. The distance between the lines $5x - 12y + 65 = 0$ and $5x - 12y - 39 = 0$ is

A. 4

B. 16

C. 2

D. 8

Answer:

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59. The co-ordinates of the foot of perpendicular from (a, 0) on the line $y = mx + \frac{a}{m}$ are

A. $\left(0, \frac{a}{m}\right)$

B. $\left(0, -\frac{a}{m}\right)$

C. $\left(\frac{a}{m}, 0\right)$

D. $\left(-\frac{a}{m}, 0\right)$

Answer:

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60. The value of $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \cos x dx$

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61. Find $\int \frac{1}{9x^2 + 6x + 5} dx$

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62. The two parabolas $x^2 = 4y$ and $y^2 = 4x$ meet in two distinct points. One of these is the origin and the other is

A. $(2, 2)$

B. $(4, -4)$

C. $(4, 4)$

D. $(-2, 2)$

Answer:

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63. The vertex of the parabola $x^2 + 2y = 8x - 7$ is

A. $\left(\frac{9}{2}, 0\right)$

B. $\left(4, \frac{9}{2}\right)$

C. $\left(2, \frac{9}{2}\right)$

D. $\left(4, \frac{7}{2}\right)$

Answer:

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64. If $P(at(2), 2at)$ be one end of a focal chord of the parabola $y^2 = 4ax$, then the length of the chord is

A. $a\left(t - \frac{1}{t}\right)^2$

B. $a\left(t - \frac{1}{t}\right)$

C. $a\left(t + \frac{1}{t}\right)$

D. $a\left(t + \frac{1}{t}\right)^2$

Answer:

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65. The length of the common chord of the parabolas $y^2 = x$ and $x^2 = y$ is

A. $2\sqrt{2}$

B. 1

C. $\sqrt{2}$

D. $\frac{1}{\sqrt{2}}$

Answer:

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66. The equation of the ellipse having vertices at $(\pm 5, 0)$ and foci $(\pm 4, 0)$ is

A. $\frac{x^2}{25} + \frac{y^2}{9} = 1$

B. $9x^2 + 25y^2 = 225$

C. $\frac{x^2}{9} + \frac{y^2}{25} = 1$

D. $4x^2 + 5y^2 = 20$

Answer:

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67. The area included between th parabolas $y^2 = 4x$ and $x^2 = 4y$ is

A. $\frac{8}{3}$ sq. units

B. 8 sq. units

C. $\frac{16}{3}$ sq. units

D. 12 sq. units

Answer:

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68. The locus of the centres of the circles which touch both the axes is given by

A. $x^2 - y^2 = 0$

B. $x^2 + y^2 = 0$

C. $x^2 - y^2 = 1$

D. $x^2 + y^2 = 1$

Answer:

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69. The sum of the series $(1 + 2) + (1 + 2 + 2^2) + (1 + 2 + 2^2 + 2^3) + \ldots..$ up to n terms is

A. $2^{n+2} - n - 4$

B. $2(2^n - 1) - n$

C. $2^{n+1} - n$

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

Answer:

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70. Find the 11th term of the sequence $\left\{\frac{1}{2}, \frac{1}{3}, \frac{1}{5}, \frac{1}{8}, \frac{1}{12}, \ldots\right\}$.

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

B. 1

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

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

Answer:

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71. The equation $\sqrt{3}\sin x + \cos x = 4$ has

A. infinitely many solutions

B. no solution

C. two solutions

D. only one solution

Answer:

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72. The value of $\tan\alpha + 2\tan(2\alpha) + 4\tan(4\alpha) + \ldots + 2^{n-1}\tan\left(2^{n-1}\alpha\right) + 2^n\cot(2^n\alpha)$ is

A. $\cot^{2^n\alpha}$

B. $2^n\tan(2^n\alpha)$

C. 0

D. $\cot\alpha$

Answer:

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73. Out of 8 given points, 3 are collinear. How many different straight lines can be drawn by joining any two points from those 8 points?

A. 26

B. 28

C. 27

D. 25

Answer:

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74. Find the following:

$$\int \frac{1}{x^2 + 2x + 2} dx$$

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75. Let α, β be the roots of $x^2 - 2x\cos\phi + 1 = 0$, then the equation whose roots are α^n, β^n is

A. $x^2 - 2x\cos n\phi - 1 = 0$

B. $x^2 - 2x\cos n\phi + 1 = 0$

C. $x^2 - 2x\sin n\phi + 1 = 0$

D. $x^2 + 2x\sin n\phi - 1 = 0$

Answer:

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76. The latus rectum of an ellipse is equal to one-half of its minor axis. The eccentricity of the ellipse is

A. $\frac{1}{\sqrt{6}}$

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

C. $-\frac{\sqrt{3}}{2}$

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

Answer:

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77. A particle is projected vertically upwards and is at a height h after t_1 seconds and again after t_2 seconds then

A. $h = gt_1t_2$

B. $h = \frac{1}{2}gt_1t_2$

C. $h = \frac{2}{g} t_1 t_2$

D. $h = \sqrt{g t_1 t_2}$

Answer:

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78. The value of the limit $\lim_{x \to 2} \frac{e^{3x-6} - 1}{\sin(2 - x)}$ is

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

B. 3

C. -3

D. -1

Answer:

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79. The limit $\lim_{x \to 2} \frac{5}{\sqrt{2} - \sqrt{x}}$ is

A. $10\sqrt{2}$

B. $+\infty$

C. $-\infty$

D. Does not exist

Answer:

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80. The range of the function $f(x) = \log_e \sqrt{4 - x^2}$ is given by

A. $(0, \infty)$

B. $(-\infty, \infty)$

C. $(-\infty, \log_e 2]$

D. $(\log_e 2, \infty)$

Answer:

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