MATHS

BOOKS - MTG MATHS (BENGALI ENGLISH)

QUESTION PAPER 2017

Multiple Choice Questions

1. Transforming to parallel axes through a point (p, q). The equation

$2x^2 + 3xy + 4y^2 + x + 18y + 25 = 0$ becomes

$2x^2 + 3xy + 4y^2 = 1$. Then

A. $p = -2, q = 3$

B. $p = 2, q = -3$

C. $p = 3, q = -4$

D. $p = -4, q = 3$

Answer:

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2. Let $A(2, -3)$ and $B(-2, 1)$ be two angular points of ΔABC. If the centroid of the triangle moves on the line $2x + 3y = 1$. Then the locus of the angular point C is given by

A. $2x + 3y = 9$

B. $2x - 3y = 9$

C. $3x + 2y = 5$

D. $3x - 2y = 3$

Answer:

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3. The point P (3, 6) is first reflected on the line y = x and then the image point Q is again reflected on the line $y = -x$ to get the image point Q'. Then the circumcentre of the $\Delta PQQ'$ is

A. (6, 3)

B. (6, -3)

C. (3, -6)

D. (0, 0)

Answer:

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4. Let d_1 and d_2 be the lengths of the perpendiculars drawn from any point of the line $7x - 9y + 10 = 0$ upon the lines $3x + 4y = 5$ and $12x + 5y = 7$ respectively. Then

A. $d_1 > d_2$

B. $d_1 = d_2$

C. $d_1 < d_2$

D. $d_1 = 2d_2$

Answer:

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5. The common chord of the circles $x^2 + y^2 - 4x - 4y = 0$ and $2x^2 + 2y^2 = 322$ subtends at the origin an angle equal to

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

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

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

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

Answer:

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6. The locus of the mid-points of the chords of the circle $x^2 + y^2 + 2x - 2y - 2 = 0$ which make an angle of 90° at

the centre is

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

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

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

D. $x^2 + y^2 + 2x - 2y - 1 = 0$

Answer:

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7. Let P be the foot of the perpendicular from focus S of hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ on the line $bx - ay = 0$ and let C be the centre of the hyperbola. Then the area of the rectangle whose sides are equal to that of SP and CP is

A. 2ab

B. ab

C. $\frac{(a^2+b^2)}{2}$

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

Answer:

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8. B is an extremity of the minor axis of an ellipse whose foci are S and S'. If $\angle SBS'$ is a right angle, then the eccentricity of the ellipse is

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

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

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

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

Answer:

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9. The axis of the parabola $x^2 + 2xy + y^2 - 5x + 5y - 5 = 0$ is

A. $x + y = 0$

B. $x + y - 1 = 0$

C. $x - y + 1 = 0$

D. $x - y = \frac{1}{\sqrt{2}}$

Answer:

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10. The line segment joining the foci of the hyperbola $x^2 - y^2 + 1 = 0$ is one of the diameters of a circle. The equation of the circle is

A. $x^2 + y^2 = 4$

B. $x^2 + y^2 = \sqrt{2}$

C. $x^2 + y^2 = 2$

D. $x^2 + y^2 = 2\sqrt{2}$

Answer:

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11. The equation of the plane through $(1, 2, -3)$ and $(2, -2, 1)$ and parallel to X-axis is

A. $y - z + 1 = 0$

B. $y - z - 1 = 0$

C. $y + z - 1 = 0$

D. $y + z + 1 = 0$

Answer:

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12. Three lines are drawn from the origin O with direction cosines proportional to (1, -1, 1). (2, -3, 0) and (1, 0, 3). The three lines are

A. not coplanar

B. coplanar

C. perpendicular to each other

D. coincident

Answer:

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13. Consider the non-constant differentiable function f of the one variable which obeys the relation $\frac{f(x)}{f(y)} = f(x-y)$. If $f'(0) = p$ and $f'(5) = q$, then $t'(-5)$ is

A. $\frac{p^2}{q}$

B. $\frac{q}{p}$

C. $\frac{p}{q}$

D. q

Answer:

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14. If $f(x) = \log_5 \log_3 x$, then f'(e) is equal to

A. $e \log_e 5$

B. $e \log_e 3$

C. $\frac{1}{e \log_e 5}$

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

Answer:

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15. Let $F(x) = e^x, G(x) = e^{-x}$ and $H(x) = G(F(x))$, where x is a real variable. Then $\frac{dH}{dx}$ at $x = 0$ is

A. 1

B. -1

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

D. $-e$

Answer:

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16. If $f''(0) = k, k \neq 0$ then the value of $\lim_{x \to 0} \frac{2f(x) - 3f(2x) + f(4x)}{x^2}$ is

A. k

B. 2k

C. 3k

D. 4k

Answer:

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17. If $y = e^{m \sin^{-1} x}$, then $\left(1 - x^2\right) \frac{d^2y}{dx^2} - x \frac{dy}{dx} - ky = 0.$

Where k is equal to

A. m^2

B. 2

C. -1

D. $-m^2$

Answer:

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18. The chord of the curve $y = x^2 + 2ax + b$. Joining the points where $x = \alpha$ and $x = \beta$. Is parallel to the tangent to the curve at abseissa x =

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

B. $\frac{2a+b}{3}$

C. $\frac{2\alpha+\beta}{3}$

D. $\frac{\alpha+\beta}{2}$

Answer:

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19. Let $f(x) = x^{13} + x^{11} + x^9 + x^7 + x^5 + x^3 + x + 19.$

Then $f(x) = 0$ has

A. 13 real roots

B. only one positive and only two negative real roots

C. not more than one real root

D. has two positive and one negative real root

Answer:

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20. Let $f(x) = \begin{cases} \frac{x^p}{(\sin x)^q} & , \text{ if } 0 < x \leq \frac{x}{2} \\ 0 & , \text{ if } x = 0 \end{cases}$ $(p, q, \in P)$. Then Lagrange's mean value theorem is applicable to f(x) in closed interval [0, x]

A. for all p, q

B. only when $p > q$

C. only when $p < q$

D. for no value of p, q

Answer:

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21. $\lim_{x \to 0} (\sin x)^{2 \tan x}$

A. is 2

B. is 1

C. is 0

D. does not exist

Answer:

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22. $\int \cos(\log x)dx = F(x) + c$, where c is an arbitrary constant. Here F(x) =

A. $x[\cos(\log x) + \sin(\log x)]$

B. $x[\cos(\log(x) - \sin(\log x)]$

C. $\frac{x}{2}[\cos(\log x) + \sin(\log x)]$

D. $\frac{x}{2}[\cos(\log x) - \sin(\log x)]$

Answer:

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23. $\int \frac{x^2 - 1}{x^4 + 3x^2 + 1} dx (x > 0)$ is

A. $\tan^{-1}\left(x + \frac{1}{x}\right) + c$

B. $\tan^{-1}\left(x - \frac{1}{x}\right) + c$

C. $\log_e \left| \frac{x + \frac{1}{x} - 1}{x + \frac{1}{x} + 1} \right| + c$

D. $\log_e \left| \frac{x - \frac{1}{x} - 1}{x - \frac{1}{x} + 1} \right| + c$

Answer:

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24. Let $l = \int_{10}^{19} \frac{\sin x}{1+x^8} dx$. Then.

A. $|l| < 10^{-9}$

B. $|l| < 10^{-7}$

C. $|l| < 10^{-5}$

D. $|l| > 10^{-7}$

Answer:

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25. Let $l_1 = \int_n^n [x]dx$ and $I_2 = \int_0^n |x|dx$, where [x] and |x| are integral and fractional parts of x and $n \in [1]$. Then l_1 / l_2 is equal to

A. $\frac{l}{n-l}$

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

C. n

D. $n-l$

Answer:

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26. The value of $\lim_{n\to\infty}\left[\frac{n}{n^2+1^2}+\frac{n}{n^2+2^2}+\ldots+\frac{1}{2n}\right]$ is

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

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

C. $\frac{\pi}{4n}$

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

Answer:

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27. The value of the integral $\int_0^1 e^{x^2} dx$

A. is less than I

B. is greater than I

C. is less than or equal to I

D. lies in the closed interval [1, e]

Answer:

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28. $\int_0^{100} e^{x-[x]}\,dx$ =

A. $\frac{e^{100}-1}{100}$

B. $\frac{e^{100}-1}{e-1}$

C. $100(e-1)$

D. $\frac{e-1}{100}$

Answer:

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29. Solution of $(x+y)^2\frac{dy}{dx}=a^2$ ('a' being a constant) is

A. $\frac{(x+y)}{a}=\tan\frac{y+c}{a}$. c is an arbitrary constant

B. $xy=a\tan cx$. c is an arbitrary constant

C. $\frac{x}{a} = \tan\frac{y}{c}$. c is an arbitrary constant

D. $xy = \tan(x + c)$. c is an arbitrary constant

Answer:

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30. The integrating factor of the first order differential equation $x^2(x^2 - 1)\frac{dy}{dx} + x(x^2 + 1)y = x^2 - 1$ is

A. e^x

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

C. $x + \frac{1}{x}$

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

Answer:

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31. In a G.P. series consisting of positive terms, Each term is equal to the sum of next two terms. Then the common ratio of this G.P. series is

A. $\sqrt{5}$

B. $\frac{\sqrt{5}.1}{2}$

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

D. $\frac{\sqrt{5}.1}{2}$

Answer:

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32. If $(\log_5 x)(\log_x 3x)(\log_{3x} y) = \log_x x^3$. Then y equals

A. 125

B. 25

C. 53

D. 243

Answer:

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33. The expression $\frac{(1+i)^n}{(1-i)^{n-2}}$ equals

A. $-i^{n+l}$

B. i^{n-l}

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

D. 1

Answer:

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34. Let $Z = x + iy$ where x and y are real. The points (x, y) in the X-Y plane for which $\frac{z+1}{z-1}$ is purely imaginary lie on

A. a straight line

B. an ellipse

C. a hyperbola

D. a circle

Answer:

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35. If p. q are odd integers. Then the roots of the equation $2px^2 + (2p + q)x + q = 0$ are

A. rational

B. irrational

C. non-real

D. equal

Answer:

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36. Out of 7 consonants and 4 vowels. Words are formed each having 3 consonants and 2 vowels. The number of such words that can be formed is

A. 210

B. 25200

C. 2520

D. 302400

Answer:

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37. The number of all numbers having 5 digits, with distinct digits is

A. 99999

B. $9 \times {}^{9}P_{4}$

C. ${}^{10}P_{5}$

D. ${}^{9}P_{4}$

Answer:

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38. The greatest integer which divides $(p+1)(p+2)(p+3)\ldots(p+q)$ for all $p \in N$ and fixed $q \in N$ is

A. $p!$

B. $q!$

C. p

D. q

Answer:

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39. Let $\left(1+x+x^2\right)^9 = a_0 + a_1 x + a_2 x^2 + \ldots . + a_{18} x^{18}$.

Then

A. $a_0 + a_2 + \ldots + a_{18} = a_1 + a_3 + \ldots\ldots + a_{17}$

B. $a_0 + a_2 + \ldots\ldots a_{18}$ is even

C. $a_0 + a_2 + \ldots\ldots a_{18}$ is divisible by 9

D. $a_0 + a_2 + \ldots\ldots a_{18}$ is divisible by 3 but not by 9

Answer:

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40. The linear system of equations $\left.\begin{aligned} 8x-3y-5z=0 \\ 5x-8y+3z=0 \\ 3x+5y-8z=0 \end{aligned}\right\}$ has

A. only 'Zero solution'

B. only finite number of non-zero solutions

C. no non-zero solution

D. infinitely many non-zero solutions

Answer:

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41. Let P be the set of all non-singular matrices of order 3 over R and Q be the set of all orthogonal matrices of order 3 over R. Then

A. P is proper subset of Q

B. Q is proper subset of P

C. Neither P is proper subset of Q nor Q is proper subset of P

D. $P \cap Q = \phi$. The void set

Answer:

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42. Let $A = \begin{pmatrix} x+2 & 3x \\ 3 & x+2 \end{pmatrix}, B = \begin{pmatrix} x & 0 \\ 5 & x+2 \end{pmatrix}$. Then all solutions of the equation det (AB) = 0 is

A. $1, -1, 0, 2$

B. $1, 4, 0, -2$

C. $1, -1, 4, 3$

D. $-1, 4, 0, 3$

Answer:

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43. The value of det A. where $A = \begin{pmatrix} 1 & \cos\theta & 0 \\ -\cos\theta & 1 & \cos\theta \\ -1 & -\cos\theta & 1 \end{pmatrix}$

lies

A. in the closed interval [1, 2]

B. in the closed interval [0, 1]

C. in the open interval (0, 1)

D. in the open interval (1, 2)

Answer:

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44. Let $f: R \to R$ be such that f is injective and $f(x)f(y) = f(x+y)$ for $\forall x, y \in R$. If f(x), f(y), (fz) are in G.P. then x, y, z are in

A. A.P always

B. G.P always

C. A.P depending on the value of x, y, z

D. G.P depending on the vallue of x, y, z

Answer:

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45. On the set R of real numbers we define xPy if and only if $xy \geq 0$. Then the relation P is

A. reflexive but not symmetric

B. symmetric but not reflexive

C. transitive but not reflexive

D. reflexive and symmetric but not transitive

Answer:

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46. On R. the relation ρ be defined by $'x\rho y$ holds if and only if $x - y$ is zero or irrational'. Then

A. ρ is reflexive and transitive but not symmetric

B. ρ is reflexive and symmetric but not transitive

C. ρ is symmetric and transitive but not reflexive

D. ρ is equivalence relation

Answer:

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47. Mean of n observation $x_1, x_2, \ldots, x_n$ is $\bar{x}$. If an observation x_q is replaced by x'_q then the new mean is

A. $\bar{x} - x_q + x'_q$

B. $\frac{(n-1)\bar{x} + x'_q}{n}$

C. $\frac{(n-1)\bar{x} - x'_q}{n}$

D. $\frac{n\bar{x} - x_q + x'_q}{n}$

Answer:

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48. The probability that a non leap year selected at random will have 53 Sundays is

A. 0

B. $1/7$

C. $2/7$

D. $3/7$

Answer:

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49. The equation $\sin x(\sin x + \cos x) = k$ has real solutions where k is a real number. Then

A. $0 \leq k \leq \frac{1+\sqrt{2}}{2}$

B. $2 - \sqrt{3} \leq k \leq 2 + \sqrt{3}$

C. $0 \leq k \leq 2 - \sqrt{3}$

D. $\frac{1-\sqrt{2}}{2} \leq k \leq \frac{1+\sqrt{2}}{2}$

Answer:

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50. The possible values of x, which satisfy the trigonometric equation $\tan^{-1}\left(\frac{x-1}{x-2}\right)+\tan^{-1}\left(\frac{x+1}{x+2}\right)=\frac{\pi}{4}$ are

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

B. $\pm\sqrt{2}$

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

D. ± 2

Answer:

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51. On set $A = |1, 2, 3|$, relations R and S are given by

$R = |(1, 1), (2, 2), (3, 3), (1, 2), (2, 1)|$

$S = |(1, 1), (2, 2), (3, 3), (1, 3), (3, 1)|$ Then

A. $R \cup S$ is an equivalence relation

B. $R \cup S$ is reflexive and transitive but not symmetric

C. $R \cup S$ is reflexive and symmetric but not transitive

D. $R \cup S$ is symmetric and transitive but not reflexive

Answer:

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52. If one of the diameters of the curve $x^2 + y^2 - 4x - 6y + 9 = 0$ is a chord of a circle with centre (1, 1). The radius of this circle is

A. 3

B. 2

C. $\sqrt{2}$

D. 1

Answer:

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53. Let $A(-1, 0)$ and $B(2, 0)$ be two points. A point M moves in the plane in such a way that $\angle MBA = 2\angle MAB$. Then the point M moves along

A. a straight line

B. a parabola

C. an ellipse

D. a hyperbola

Answer:

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54. If $f(x) = \int_{-1}^{x} |t| dt$, then for any $x \geq 0$. $f(x)$ is equal to

A. $\frac{1}{2}(1 - x^2)$

B. $1 - x^2$

C. $\frac{1}{2}(1 + x^2)$

D. $1 + x^2$

Answer:

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55. Let for all $x > 0$, $f(x) = \lim_{n \to \infty} n\left(x^{\frac{l}{n}} - 1\right)$, then

A. $f(x) + f\left(\frac{1}{x}\right) = 1$

B. $f(xy) = f(x) + f(y)$

C. $f(xy) = xf(y) + yf(x)$

D. $f(xy) = xf(x) + yf(y)$

Answer:

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56. Let $l = \int_0^{100\pi} \sqrt{(1 - \cos 2x)}dx$, then

A. $l = 0$

B. $l = 200\sqrt{2}$

C. $l = \pi\sqrt{2}$

D. $l = 100$

Answer:

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57. The area of the figure bounded by the parabolas $x = -2y^2$ and $x = 1 - 3y^2$ is

A. $\frac{4}{3}$ square units

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

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

D. $\frac{6}{7}$ square units

Answer:

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58. Tangents are drawn to the ellipse $\frac{x^2}{9}+\frac{y^2}{5}=1$ at the ends of both latusrectum. The area of the quadrilateral so formed is

A. 27 sq. units

B. $\frac{13}{2}$ sq. units

C. $\frac{15}{4}$ sq. units

D. 45 sq. units

Answer:

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59. The value of K in order that $f(x) = \sin x - \cos x - Kx + 5$ decreases for all positive real values of x is given by

A. $K < 1$

B. $K \geq 1$

C. $K > \sqrt{2}$

D. $K < \sqrt{2}$

Answer:

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60. For any vector $\vec{x}$. Then value of $\left(\vec{x} \times \hat{i}\right)^2 + \left(\vec{x} \times \hat{j}\right)^2 + \left(\vec{x} \times \hat{k}\right)^2$ is equal to

A. $\left|\overrightarrow{x}\right|^2$

B. $2\left|\overrightarrow{x}\right|^2$

C. $3\left|\overrightarrow{x}\right|^2$

D. $4\left|\overrightarrow{x}\right|^2$

Answer:

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61. If the sum of two unit vectors is a unit vector. Then the magnitude of their difference is

A. $\sqrt{2}$ units

B. 2 units

C. $\sqrt{3}$ units

D. $\sqrt{5}$ units

Answer:

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62. Let α and β be the roots of $x^2 + x + 1 = 0$. If n be positive integer, then $\alpha^n + \beta^n$ is

A. $2\cos\frac{2n\pi}{3}$

B. $2\sin\frac{2n\pi}{3}$

C. $2\cos\frac{n\pi}{3}$

D. $2\sin\frac{n\pi}{3}$

Answer:

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63. For real x, the greatest value of $\frac{x^2+2x+4}{2x^2+4x+9}$ is

A. 1

B. -1

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

D. $\frac{1}{4}$

Answer:

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64. Let $A = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix}$. Then for positive integer n. A^n is

A. $\begin{pmatrix} 1 & n & n^2 \\ 0 & n^2 & n \\ 0 & 0 & n \end{pmatrix}$

B. $\begin{pmatrix} 1 & n & n\left(\frac{n+1}{2}\right) \\ 0 & 1 & n \\ 0 & 0 & 1 \end{pmatrix}$

C. $\begin{pmatrix} 1 & n^2 & n \\ 0 & n & n^2 \\ 0 & 0 & n^2 \end{pmatrix}$

D. $\begin{pmatrix} 1 & n & 2n-1 \\ 0 & \frac{n+1}{2} & n^2 \\ 0 & 0 & \frac{n+1}{2} \end{pmatrix}$

Answer:

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65. Let a, b, c be such that $b(a+c) \neq 0$.

If

$$\begin{vmatrix} a & a+1 & a-1 \\ -b & b+1 & b-1 \\ c & c-1 & c+1 \end{vmatrix} + \begin{vmatrix} a+1 & b+1 & c-1 \\ a-1 & b-1 & c+1 \\ (-1)^{n+2}a & (-1)^{n+1}b & (-1)^{n}c \end{vmatrix} = 0$$

, then the value of n is

A. any integer

B. zero

C. any even integer

D. any odd integer

Answer:

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66. Let $f: R \to R$ be twice continuously differentiable. Let $f(0) = f(1) = f'(0) = 0$. Then

A. $f''(x) \neq 0$ for all x

B. $f''(c) = 0$ for some $c \in R$

C. $f''(x) \neq 0$ if $x \neq 0$

D. $f'(x) > 0$ for all x

Answer:

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67. If $f(x) = x^n$, n being a non-negative integer, then the values of n for which $f'(\alpha + \beta) = t'(\alpha) + f'(\beta)$ for all $\alpha. \beta > 0$ is

A. 1

B. 2

C. 0

D. 5

Answer:

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68. Let f be a non-constant continuous function for all $x \geq 0$.

Let f satisfy the relation $f(x)f(a-x) = 1$ for some $a \in R$.

Then $I = \int_0^a \frac{dx}{1+f(x)}$ is equal to

A. a

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

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

D. $f(a)$

Answer:

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69. If the line $ax + by + c = 0, ab \neq 0$, is a tangent to the curve $xy = 1 - 2x$. Then

A. $a > 0, b < 0$

B. $a > 0, b > 0$

C. $a < 0, b > 0$

D. $a < 0, b < 0$

Answer:

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70. Two particles move in the same straight line starting at the same moment from the same point in the same direction. The first moves with constant velocity u and the second starts from rest with constant acceleration f. Then

A. they will be at the greatest distance at the end of time $\frac{u}{2f}$ from the start

B. they will be at the greatest distance at the end of time $\frac{u}{f}$ from the start

C. their greatest distance is $\frac{u^2}{2f}$

D. their greatest distance is $\frac{u^2}{f}$

Answer:

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71. The complex number z satisfying the equation $|z-i| = |z+1| = 1$ is

A. 0

B. $1+i$

C. $-1+i$

D. $1-i$

Answer:

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72. On R, the set of real numbers, a relation ρ is defined as $'a\rho b$ if and only if $1+ab > 0'$. Then

A. ρ is an equivalence relation

B. ρ is reflexive and transitive but not symmetric

C. ρ is reflexive and symmetric but not transitive

D. ρ is only symmetric

Answer:

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73. If $a, b \in \{1, 2, 3\}$ and the equation $ax^2 + bx + 1 = 0$ has real roots, then

A. $a > b$

B. $a \leq b$

C. number of possible ordered pairs (a, b) is 3

D. $a < b$

Answer:

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74. If the tangent to $y^2 = 4ax$ at the point $(at^2, 2at)$ where $|t| > 1$ is a normal to $x^2 - y^2 = a^2$ at the point $(a\sec\theta.\ \tan\theta)$, then,

A. $t = -\cos ec\theta$

B. $t = -\sec\theta$

C. $t = 2\tan\theta$

D. $t = 2\cot\theta$

Answer:

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75. The focus of the conic $x^2 - 6x + 4y + 1 = 0$ is

A. (2, 3)

B. (3, 2)

C. (3, 1)

D. (1, 4)

Answer: C

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