



MATHS

BOOKS - MTG MATHS (BENGALI ENGLISH)

QUESTION PAPER 2016

Multiple Choice Questions

1. If the vertex of conic $y^2 - 4y = 4x - 4a$ always lies between the straight lines, $x + y = 3$ and $2x + 2y - 1 = 0$ then

A. $2 < a < 4$

B. $-\frac{1}{2} < a < 2$

C. $0 < a < 2$

D. $-\frac{1}{2} < a < 3/2$

Answer:



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2. A straight line joining the points $(1, 1, 1)$ and $(0, 0, 0)$ intersects the plane $2x + 2y + z = 10$ at

A. $(1, 2, 5)$

B. $(2, 2, 2)$

C. $(2, 1, 5)$

D. $(1, 1, 6)$

Answer:



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3. Angle between the planes $x + y + 2z = 6$ and $2x - y + z = 9$ is

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

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

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

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

Answer:



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4. If $y = (1 + x)(1 + x^2)(1 + x^4) \dots (1 + x^{2^n})$ then the value of $\left(\frac{dy}{dx}\right)$ at $x = 0$ is

A. 0

B. -1

C. 1

D. 2

Answer:



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5. IF $f(x)$ is an odd differentiable function defined on $(-\infty, \infty)$ such that $f'(3) = 2$, then $f'(-3)$ equal to

A. 0

B. 1

C. 2

D. 4

Answer:



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6. $\lim_{x \rightarrow 1} \left(\frac{1+x}{2+x} \right)^{\frac{1}{2}}$

A. is 1

B. does not exist

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

D. is 2

Answer:

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7. If $f(x) = \tan^{-1} \left[\frac{\log\left(\frac{e}{x^2}\right)}{\log(ex^2)} \right] + \tan^{-1} \left[\frac{3 + 2 \log x}{1 - 6 \log x} \right]$ then the value of

$f'(x)$ is

A. x^2

B. x

C. 1

D. 0

Answer:

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8. $\int \frac{\log \sqrt{x}}{3x} dx$ is equal to

A. $\frac{1}{3} (\log \sqrt{x})^2 + c$

B. $\frac{2}{3} (\log \sqrt{x})^2 + c$

C. $\frac{2}{3} (\log x)^2 + c$

D. $\frac{1}{3} (\log x)^2 + c$

Answer:



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9. $\int 2^x (f'(x) + f(x) \log 2) dx$ is equal to

A. $2^x f'(x) + c$

B. $2^x \log 2 + c$

C. $2^x f(x) + c$

D. $2^x + c$

Answer:



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10. $\int_0^1 \log\left(\frac{1}{x} - 1\right) dx =$

A. 1

B. 0

C. 2

D. None of these

Answer:



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11. The value of $\lim_{n \rightarrow \infty} \left\{ \frac{\sqrt{n+1} + \sqrt{n+2} + \dots + \sqrt{2n-1}}{n^{3/2}} \right\}$ is

A. $\frac{2}{3}(2\sqrt{2} - 1)$

B. $\frac{2}{3}(\sqrt{2} - 1)$

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

D. $\frac{2}{3}(2\sqrt{2} + 1)$

Answer:



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12. If the solution of the differential equation $x \frac{dy}{dx} + y = xe^x$ be, $xy = e^x \varphi(x) + c$ then $\varphi(x)$ is equal to

A. $x + 1$

B. $x - 1$

C. $1 - x$

D. x

Answer:



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13. The order of the differential equation of all parabolas whose axis of symmetry along x - axis is

A. 2

B. 3

C. 1

D. None of these

Answer:



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14. The line $y = x + \lambda$ is tangent to the ellipse $2x^2 + 3y^2 = 1$. Then λ is

A. -2

B. 1

C. $\sqrt{\frac{5}{6}}$

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

Answer:



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15. The area enclosed by $y = \sqrt{5 - x^2}$ and $y = |x - 1|$ is

A. $\left(\frac{5\pi}{4} - 2\right)$ sq. units

B. $\frac{5\pi - 2}{2}$ sq. units

C. $\left(\frac{5\pi}{4} - \frac{1}{2}\right)$ sq. units

D. $\left(\frac{\pi}{2} - 5\right)$ sq. units

Answer:



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16. Let S be the set of points whose abscissas and ordinates are natural numbers. Let $P \in S$ such that the sum of the distance of P from $(8,0)$ and $(0, 12)$ is minimum among all elements in S . Then the number of such points P in S is

A. 1

B. 3

C. 5

D. 11

Answer:



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17. Time period T of a simple pendulum of length l is given by

$T = 2\pi\sqrt{\frac{l}{g}}$. If the length is increased by 2%, then an approximate

change in the time period is

A. 2 %

B. 1 %

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

D. None of these

Answer:



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18. The cosine of the angle between any two diagonals of a cube is

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

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

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

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

Answer:



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19. If x is a positive real number different from 1 such that $\log_a x, \log_b x, \log_c x$ are in A.P., then

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

B. $b = \sqrt{ac}$

C. $c^2 = (ac)^{\log_a b}$

D. None of (A), (B), (C) are correct

Answer:

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20. If a, x are real numbers and $|a| < 1, |x| < 1$, then $1 + (1 + a)x + (1 + a + a^2)x^2 + \dots \infty$ is equal to

A. $\frac{1}{(1 - a)(1 - ax)}$

B. $\frac{1}{(1 - a)(1 - x)}$

C. $\frac{1}{(1-x)(1-ax)}$

D. $\frac{1}{(1+ax)(1-a)}$

Answer:



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21. If $\log_{0.3}(x-1) < \log_{0.09}(x-1)$, then x lies in the interval

A. $(2, \infty)$

B. $(1, 2)$

C. $(-2, -1)$

D. None of these

Answer:



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22. The value of $\sum_{n=1}^{13} (i^n + i^{n+1})$, $i = \sqrt{-1}$ is

- A. i
- B. $i - 1$
- C. 1
- D. 0

Answer:



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23. If z_1, z_2, z_3 are complex numbers such that

$|z_1| = |z_2| = |z_3| = \left| \frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3} \right| = 1$ then $|z_1 + z_2 + z_3|$ is

- A. equal to 1
- B. less than 1
- C. greater than 1

D. equal to 3

Answer:

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24. If p, q are the roots of the equation $x^2 + px + q = 0$, then

A. $p = 1, q = -2$

B. $p = 0, q = 1$

C. $p = -2, q = 0$

D. $p = -2, q = 1$

Answer:

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25. The number of values of k for which the equation $x^2 - 3x + k = 0$ has two distinct roots lying in the interval $(0, 1)$ are

- A. three
- B. two
- C. infinitely many
- D. no value of k satisfies the requirement

Answer:



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26. The number of ways in which the letters of the word ARRANGE can be permuted such that the R's occur together is

- A. $\frac{7!}{2!2!}$
- B. $\frac{7!}{2!}$
- C. $\frac{6!}{2!}$

D. $\underline{5} \times \underline{2}$

Answer:



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27. If, $\frac{1}{{}^5C_r} + \frac{1}{{}^6C_r} = \frac{1}{{}^4C_r}$, then the value of r equals to

A. 4

B. 2

C. 5

D. 3

Answer:



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28. For +ve integer n , $n^3 + 2n$ is always divisible by

A. 3

B. 7

C. 5

D. 6

Answer:



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29. The coefficient of x^{17} in the expansion of $(x-1)(x-2)(x-3)\dots(x-18)$ is

A. 684

B. -171

C. 171

D. -342

Answer:



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30. $1 + {}^n C_1 \cos \theta + {}^n C_2 \cos 2\theta + \dots + {}^n C_n \cos n\theta$ equals

A. $\left(2 \cos \frac{\theta}{2}\right)^n \cos \frac{n\theta}{2}$

B. $2 \cos^2 \frac{n\theta}{2}$

C. $2 \cos^{2n} \frac{\theta}{2}$

D. $\left(2 \cos^2 \frac{\theta}{2}\right)^n$

Answer:



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31. If x , y and z be greater than 1, then the value of

$$\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \\ \log_z x & \log_z y & 1 \end{vmatrix} \text{ is}$$

A. $\log x \cdot \log y \cdot \log z$

B. $\log x + \log y + \log z$

C. 0

D. $1 - \{(\log x) \cdot (\log y) \cdot (\log z)\}$

Answer:



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32. Let A is a 3×3 matrix and B is its adjoint matrix. If $|B| = 64$, then

$|A| =$

A. ± 2

B. ± 4

C. ± 8

D. ± 12

Answer:



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33. Let $\begin{pmatrix} \cos \frac{\pi}{4} & -\sin \frac{\pi}{4} \\ \sin \frac{\pi}{4} & \cos \frac{\pi}{4} \end{pmatrix}$ and $x = \begin{pmatrix} \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{pmatrix}$ then Q^3x is equal to

- A. $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$
- B. $\begin{pmatrix} -\frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{pmatrix}$
- C. $\begin{pmatrix} -1 \\ 0 \end{pmatrix}$
- D. $\begin{pmatrix} -\frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} \end{pmatrix}$

Answer:



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34. Let R be a relation defined on the set Z of all integers and xRy when $x + 2y$ is divisible by 3. Then

- A. R is not transitive
- B. R is symmetric only
- C. R is an equivalence relation

D. R is not an equivalence relation

Answer:

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35. If $A = \{3^n - 2n - 1 : n \in \mathbb{N}\}$ and $B = \{4(n - 1) : n \in \mathbb{N}\}$, then

A. $A = B$

B. $A \cap B = \phi$

C. $A \subset B$

D. $B \subseteq A$

Answer:

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36. If the function $f: R \rightarrow R$ is defined by $f(x) = (x^2 + 1)^{35} \forall x \in R$, then f is

- A. one - one but not onto
- B. one but not one - one
- C. neither one - one nor onto
- D. both one - one and onto

Answer:



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37. Standard Deviation of n observations $a_1, a_2, a_3, \dots, a_n$ is σ . Then the standard deviation of the observations $\lambda a_1, \lambda a_2, \dots, \lambda a_n$ is

- A. $\lambda\sigma$
- B. $-\lambda\sigma$
- C. $|\lambda|\sigma$

D. $\lambda^n \sigma$

Answer:



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38. Let A and B be two events such that

$$P(A \cap B) = \frac{1}{6}, P(A \cup B) = \frac{31}{45} \text{ and } P(\overline{B}) = \frac{7}{10} \text{ then}$$

A. A and B are independent

B. A and B are mutually exclusive

C. $P\left(\frac{A}{B}\right) < \frac{1}{6}$

D. $P\left(\frac{B}{A}\right) < \frac{1}{6}$

Answer:



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39. The value of $\cos 15^\circ \cos 7\frac{1^\circ}{2} \sin 7\frac{1^\circ}{2}$ is

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

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

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

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

Answer:



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40. The smallest positive root of the equation $\tan x - x = 0$ lies in

A. $(0, \pi/2)$

B. $(\pi/2, \pi)$

C. $\left(\pi, \frac{3\pi}{2}\right)$

D. $\left(\frac{3\pi}{2}, 2\pi\right)$

Answer:



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41. If in a triangle ABC , AD , BE and CF are the altitudes and R is the circumradius, then the radius of the circumcircle of $\triangle DEF$ is

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

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

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

D. None of these

Answer:



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42. The points $(-a, -b)$, (a, b) , $(0, 0)$ and (a^2, ab) , $a \neq 0$, $b \neq 0$ are always

A. collinear

B. vertices of a parallelogram

C. vertices of a rectangle

D. lie on a circle

Answer:



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43. The line AB cuts off intercepts $2a$ from the axes. From any point, P on the line AB perpendiculars PR and PS are drawn on the axes. Locus of mid-point of RS is

A. $x - y = \frac{a}{2}$

B. $x + y = a$

C. $x^2 + y^2 = 4a^2$

D. $x^2 - y^2 = 2a^2$

Answer:



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44. $x + 8y - 22 = 0$, $5x + 2y - 34 = 0$, $2x - 3y + 13 = 0$ are the three sides of a triangle. The area of the triangle is

- A. 36 square unit
- B. 19 square unit
- C. 42 square unit
- D. 72 square unit

Answer:



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45. The line through the points (a, b) and $(-a, -b)$ passes through the point

A. (1, 1)

B. (3a, - 2b)

C. (a², ab)

D. (a, b)

Answer:



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46. The locus of the point of intersection of the straight lines

$\frac{x}{a} + \frac{y}{b} = K$ and $\frac{x}{a} - \frac{y}{b} = \frac{1}{K}$, where K is a non - zero real variable, is

given by

A. a straight line

B. an ellipse

C. a parabola

D. a hyperbola

Answer:



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47. The equation of a line parallel to the line $3x + 4y = 0$ and touching the circle $x^2 + y^2 = 9$ in the first quadrant is

A. $3x + 4y = 15$

B. $3x + 4y = 45$

C. $3x + 4y = 9$

D. $3x + 4y = 27$

Answer:



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48. A line passing through the point of intersection of $x + y = 4$ and $x - y = 2$ makes an angle $\tan^{-1}\left(\frac{3}{4}\right)$ with the x-axis. It intersects the

parabola $y^2 = 4(x - 3)$ at points (x_1, y_1) and (x_2, y_2) respectively. Then

$|x_1 - x_2|$ is equal to ,

A. $\frac{16}{9}$

B. $\frac{32}{9}$

C. $\frac{40}{9}$

D. $\frac{80}{9}$

Answer:



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49. The equation of auxiliary circle of the ellipse

$$16x^2 + 25y^2 + 32x - 100y = 284$$
 is

A. $x^2 + y^2 + 2x - 4y - 20 = 0$

B. $x^2 + y^2 + 2x - 4y = 0$

C. $(x + 1)^2 + (y - 2)^2 = 400$

$$D. (x + 1)^2 + (y - 2)^2 = 225$$

Answer:



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50. If PQ is a double ordinate of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ such that $\triangle OPQ$ is equilateral, O being the centre. Then the eccentricity e satisfies

A. $1 < e < \frac{2}{\sqrt{3}}$

B. $e = \frac{2}{\sqrt{2}}$

C. $e = \frac{\sqrt{3}}{2}$

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

Answer:



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51. For non-zero vectors \vec{a} and \vec{b} if $|\vec{a} + \vec{b}| < |\vec{a} - \vec{b}|$, then \vec{a} and \vec{b} are

- A. collinear
- B. perpendicular to each other
- C. inclined at an acute angle
- D. inclined at an obtuse angle

Answer:

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52. General solution of $y \frac{dy}{dx} + by^2 = a \cos x$, $0 < x < 1$ is

Here c is an arbitrary constant

- A. $y^2 = 2a(2b \sin x + \cos x) + ce^{-2bx}$
- B. $(4b^2 + 1)y^2 = 2a(\sin x + 2b \cos x) + ce^{-2bx}$
- C. $(4b^2 + 1)y^2 = 2a(\sin x + 2b \cos x) + ce^{2bx}$

$$D. y^2 = 2a(2b \sin x + \cos x) + ce^{-2bx}$$

Answer:



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53. The points of the ellipse $16x^2 + 9y^2 = 400$ at which the ordinate decreases at the same rate at which the abscissa increases is/are given by

- A. $\left(3, \frac{16}{3}\right)$ & $\left(-3, \frac{-16}{3}\right)$
- B. $\left(3, \frac{-16}{3}\right)$ & $\left(-3, \frac{16}{3}\right)$
- C. $\left(\frac{1}{16}, \frac{1}{9}\right)$ & $\left(-\frac{1}{16}, -\frac{1}{9}\right)$
- D. $\left(\frac{1}{16}, -\frac{1}{9}\right)$ & $\left(-\frac{1}{16}, \frac{1}{9}\right)$

Answer:



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54. The letters of the word COCHIN are permuted and all permutations are arranged in an alphabetical order as in an English dictionary. The number of words that appear before the word COCHIN is

- A. 96
- B. 48
- C. 183
- D. 267

Answer:



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55. If the matrix $A = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 2 & 0 & 2 \end{pmatrix}$, then $A^n = \begin{pmatrix} a & 0 & 0 \\ 0 & a & 0 \\ b & 0 & a \end{pmatrix}$, $n \in N$

where

- A. $a = 2n, b = 2^n$
- B. $a = 2^n, b = 2n$

C. $a = 2^n, b = n2^{n-1}$

D. $a = 2^n, b = n2^n$

Answer:



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56. The sum of n terms of the following series, $1^3 + 3^3 + 5^3 + 7^3 + \dots$

is

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

B. $n^3(n - 1)$

C. $n^3 + 8n + 4$

D. $2n^4 + 3n^2$

Answer:



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57. If α and β are roots of $ax^2 + bx + c = 0$ then the equation whose roots are α^2 and β^2 is

A. $a^2x^2 - (b^2 - 2ac)x + c^2 = 0$

B. $a^2x^2 + (b^2 - ac)x + c^2 = 0$

C. $a^2x^2 + (b^2 + ac)x + c^2 = 0$

D. $a^2x^2 + (b^2 + 2ac)x + c^2 = 0$

Answer:



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58. If ω is an imaginary cube root of unity, then the value of $(2 - \omega)(2 - \omega^2) + 2(3 - \omega)(3 - \omega^2) + \dots + (n - 1)(n - \omega)(n - \omega^2)$ is

A. $\frac{n^2}{4}(n + 1)^2 - n$

B. $\frac{n^2}{4}(n + 1)^2 + n$

C. $\frac{n^2}{4}(n + 1)^2$

D. $\frac{n^2}{4}(n + 1) - n$

Answer:



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59. If ${}^nC_{r-1} = 36$, ${}^nC_r = 84$ and ${}^nC_{r+1} = 126$ then the value of nC_8 is

A. 10

B. 7

C. 9

D. 8

Answer:



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60. In a group 14 males and 6 females, 8 and 3 of the males and females respectively are aged above 40 years. The probability that a person selected at random from the group is aged above 40 years, given that the selected person is a female, is

A. $\frac{2}{7}$

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

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

D. $\frac{5}{6}$

Answer:



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61. The equation $x^3 - yx^2 + x - y = 0$ represents

A. a hyperbola and two straight lines

B. a straight line

C. a parabola and two straight lines

D. a straight line and a circle

Answer:



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62. The locus of the midpoints of chords of the circle $x^2 + y^2 = 1$ which subtends a right angle at the origin is

A. $x^2 + y^2 = \frac{1}{4}$

B. $x^2 + y^2 = \frac{1}{2}$

C. $xy = 0$

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

Answer:



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63. The locus of the midpoints of all chords of the parabola $y^2 = 4ax$ through its vertex is another parabola with directrix

A. $x = -a$

B. $x = a$

C. $x = 0$

D. $x = -\frac{a}{2}$

Answer:



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64. If $[x]$ denotes the greatest integer less than or equal to x , then the value of the integral $\int_0^2 x^2 [x] dx$ equals

A. $\frac{5}{3}$

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

C. $\frac{8}{3}$

D. $\frac{4}{3}$

Answer:



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65. The number of points at which the function $f(x) = \max \{a - x, a + x, b\}$, $-\infty < x < \infty$, $0 < a < b$ cannot be differentiable

A. 0

B. 1

C. 2

D. 3

Answer:



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66. If the parabola $x^2 = ay$ makes an intercept of length $\sqrt{40}$ unit on the $y - 2x = 1$ then a is equal to

- A. 1
- B. -2
- C. -1
- D. 2

Answer:



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67. If $f(x)$ is a function such that $f'(x) = (x - 1)^2(4 - x)$, then

- A. $f(0) = 0$
- B. $f(x)$ is increasing in $(0, 3)$
- C. $x = 4$ is a critical point of $f(x)$
- D. $f(x)$ is decreasing in $(3, 5)$

Answer:



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68. On the ellipse $4x^2 + 9y^2 = 1$, the points at which the tangents are parallel to the line $8x = 9y$ are

A. $\left(\frac{2}{5}, \frac{1}{5}\right)$

B. $\left(-\frac{2}{5}, \frac{1}{5}\right)$

C. $\left(-\frac{2}{5}, -\frac{1}{5}\right)$

D. $\left(\frac{2}{5}, -\frac{1}{5}\right)$

Answer:



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69. If $\varphi(t) = \begin{cases} 1, & \text{for } 0 \leq t < 1 \\ 0 & \text{otherwise} \end{cases}$ then

$$\int_{-3000}^{3000} \left(\sum_{r'=2014}^{2016} \varphi(t-r')\varphi(t-2016) \right) dt =$$

- A. a real number
- B. 1
- C. 0
- D. does not exist

Answer:

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70. If the equation $x^2 + y^2 - 10x + 21 = 0$ has real roots $x = \alpha$ and $y = \beta$ then

- A. $3 \leq x \leq 7$
- B. $3 \leq y \leq 7$

C. $-2 \leq y \leq 2$

D. $-2 \leq x \leq 2$

Answer:

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71. If $z = \sin \theta - i \cos \theta$ then for any integer n ,

A. $Z^n + \frac{1}{Z^n} = 2 \cos\left(\frac{n\pi}{2} - n\theta\right)$

B. $Z^n + \frac{1}{Z^n} = 2 \sin\left(\frac{n\pi}{2} - n\theta\right)$

C. $Z^n - \frac{1}{Z^n} = 2i \sin\left(n\theta - \frac{n\pi}{2}\right)$

D. $Z^n - \frac{1}{Z^n} = 2i \cos\left(\frac{n\pi}{2} - n\theta\right)$

Answer:

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72. Let $f: X \rightarrow X$ be such that $f(f(x)) = x$ for all $x \in X$ and $X \subseteq R$, then

- A. f is one-to-one
- B. f is onto
- C. f is one-to-one but not onto
- D. f is onto but not one-to-one

Answer:



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73. If A, B are two events such that $P(A \cup B) \geq \frac{3}{4}$ and $\frac{1}{8} \leq P(A \cap B) \leq \frac{3}{8}$ then

- A. $P(A) + P(B) \leq \frac{11}{8}$
- B. $P(A) \cdot P(B) \leq \frac{3}{8}$
- C. $P(A) + P(B) \geq \frac{7}{8}$

D. None of these

Answer:

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74. If the first and the $(2n + 1)^{th}$ terms of an AP, GP and HP are equal and their n^{th} terms are respectively a, b, c then always

A. $a = b = c$

B. $a \geq b \geq c$

C. $a + c = b$

D. $ac - b^2 = 0$

Answer:

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75. The coordinates of a point on the line $x + y + 1 = 0$ which is at a distance $\frac{1}{5}$ unit from the line $3x + 4y + 2 = 0$ are

A. $(2, -3)$

B. $(-3, 2)$

C. $(0, -1)$

D. $(-1, 0)$

Answer:



Watch Video Solution