



MATHS

BOOKS - MTG MATHS (BENGALI ENGLISH)

QUESTION PAPER 2012

Multiple Choice Questions

1. If $(\alpha + \beta)$ and $(\alpha - \sqrt{\beta})$ are the roots of the equation $x^2 + px + q = 0$ where α, β, p and q are real, then the roots of the equation $(p^2 - 4q)(p^2x^2 + 4px) - 16q = 0$ are

- A. $\left(\frac{1}{\alpha} + \frac{1}{\sqrt{\beta}}\right)$ and $\left(\frac{1}{\alpha} - \frac{1}{\sqrt{\beta}}\right)$
- B. $\left(\frac{1}{\sqrt{\alpha}} + \frac{1}{\beta}\right)$ and $\left(\frac{1}{\sqrt{\alpha}} - \frac{1}{\beta}\right)$
- C. $\left(\frac{1}{\sqrt{\alpha}} + \frac{1}{\sqrt{\beta}}\right)$ and $\left(\frac{1}{\sqrt{\alpha}} - \frac{1}{\sqrt{\beta}}\right)$
- D. $(\sqrt{\alpha} + \sqrt{\beta})$ and $(\sqrt{\alpha} - \sqrt{\beta})$

Answer:



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2. The number of solution of the equation

$$\log_2(x^2 + 2x - 1) = 1 \text{ is}$$

A. 0

B. 1

C. 2

D. 3

Answer:



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3. The sum of series

$1 + \frac{1}{2} {}^n C_1 + \frac{1}{3} {}^n C_2 + \dots + \frac{1}{n+1} {}^n C_n$ is equal to

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

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

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

D. $\frac{2^n + 1}{2n}$

Answer:



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4. The value of $\sum_{r=2}^{\infty} \frac{1 + 2 + \dots + (r - 1)}{r!}$ is equal to

A. e

B. $2e$

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

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

Answer:



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5. If $p = \begin{bmatrix} 1 & 2 & 1 \\ 1 & 3 & 1 \end{bmatrix}$, $Q = PP^T$ then the value of the determinant of Q is equal to

A. 2

B. -2

C. 1

D. 0

Answer:



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6. The remainder obtained when $1! + 2! + 95!$ is divided by 15 is

A. 14

B. 3

C. 1

D. 0

Answer:



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7. If P, Q, R are angles of triangle PQR then the value of

$$\begin{vmatrix} -1 & \cos R & \cos Q \\ \cos R & -1 & \cos P \\ \cos Q & \cos P & -1 \end{vmatrix} \text{ is equal to}$$

A. -1

B. 0

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

D. 1

Answer:



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8. The number of real values of α for which the system

$$x + 3y + 5z = \alpha x$$

of equations $5x + y + 3z = \alpha y$ has infinite number of

$$3x + 5y + z = \alpha z$$

solutions is

A. 1

B. 2

C. 4

D. 9

Answer:



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9. The total number of injections (one-one into mapping) (from $\{a_1, a_2, a_3, a_4\}$ to $\{b_1, b_2, b_3, b_4, b_5, b_6, b_7\}$) is

A. 400

B. 420

C. 800

Answer:**Watch Video Solution****10.**

Let

$$(1 + x)^{10} = \sum_{r=0}^{10} c_r x^r, \quad \text{and} \quad (1 + x)^7 = \sum_{r=0}^7 d_r x^r. \quad \text{If}$$

$$P = \sum_{r=0}^5 c_{2r} \quad \text{and} \quad Q = \sum_{r=0}^3 d_{2r+1}, \quad \text{then} \quad \frac{P}{Q} \quad \text{is equal to}$$

A. 4

B. 8

C. 16

D. 32

Answer:



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11. Two decks of playing cards are well shuffled and 26 cards are randomly distributed to a player. Then the probability that the player gets all distinct cards is

A. ${}^{52}C_{26} / {}^{104}C_{26}$

B. $2 \times {}^{52}C_{26} / {}^{104}C_{26}$

C. $2^{13} \times {}^{52}C_{26} / {}^{104}C_{26}$

D. $2^{26} \times {}^{52}C_{26} / {}^{104}C_{26}$

Answer:



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12. An urn contains 9 red and 5 white balls. Three balls are drawn at random. Then the probability that balls of both colours are drawn is

A. $\frac{40}{143}$

B. $\frac{70}{143}$

C. $\frac{3}{13}$

D. $\frac{10}{13}$

Answer:



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13. Two coins are available, one fair the other two-headed. Choose a coin and toss it once, assume that the unbiased coin is chosen with probability $\frac{3}{4}$. Given that the outcome is head, the probability that the two-headed coin was chosen is

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

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

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

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

Answer:



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14. Let \mathbb{R} be the set of real numbers and the function $f: \mathbb{R} \rightarrow \mathbb{R}$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ be defined by $(f)x = x^2 + 2x - 3$ and $g(x) = x + 1$. The the value of x for which $f(g(x)) = -g(f(x))$, is

A. -1

B. 0

C. 1

D. 2

Answer:



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15. If a, b, c are in arithmetic progression then the roots of the equation $ax^2 - 2bx + c = 0$ are

A. 1 and $\frac{c}{a}$

B. $-\frac{1}{a}$ and $-c$

C. -1 and $-\frac{c}{a}$

D. -2 and $-\frac{c}{2a}$

Answer:



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16. The equation $y^2 + 4x + 4y + k = 0$ represents a parabola whose latus rectum is

A. 1

B. 2

C. 3

D. 4

Answer:



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17. If the circles
 $x^2 + y^2 + 2x + 2ky + 6 = 0$ and $x^2 + y^2 + 2ky + k = 0$
intersect orthogonally, then k is equal to

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

B. -2 or $-\frac{3}{2}$

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

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

Answer:



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18. If four distinct points $(2k, 3k)(2, 0)(0, 3)(0, 0)$ lie on a circle, then

A. $k < 0$

B. $0 < k < 1$

C. $k=1$

D. $k > 1$

Answer:



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19. The line joining $A(b \cos \alpha, b \sin \alpha)$ and $B(a \cos \beta, a \sin \beta)$, where $a \neq b$ is produced to the point $M(x, y)$ so that $AM:MB = b:a$. Then $x \cos \frac{\alpha + \beta}{2} + y \sin \frac{\alpha + \beta}{2}$ is equal to

A. 0

B. 1

C. -1

D. $a^1 + b^2$

Answer:



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20. Let the foci of the ellipse $\frac{x^2}{9} + y^2 = 1$ subtend a right angle at a point P. then the locus of P is

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

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

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

D. $x^2 + y^2 = 8$

Answer:



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21. The general solution of the differential equation

$$\frac{dy}{dx} = \frac{x + y + 1}{2x + 2y + 1} \text{ is}$$

A. $\log_e |3x + 3y + 2| + 3x + 6y = c$

B. $\log_e |3x + 3y + 2| - 3x + 6y = c$

C. $\log_e |3x + 3y + 2| + 3x - 6y = c$

D. $\log_e |3x + 3y + 2| + 3x - 6y = c$

Answer:



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22. The value of the integral

$$\int_{\pi/6}^{\pi/2} \left(\frac{1 + \sin 2x + \cos 2x}{\sin x + c} \right) dx \text{ is equal to}$$

A. 16

B. 8

C. 4

D. 1

Answer:



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23. The value of the integral $\int_0^{\frac{\pi}{2}} \frac{1}{1 + (\tan x)^{101}} dx$ is equal to

A. 1

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

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

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

Answer:



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24. The integrating factor of the differential equation

$$3x \log_e x \frac{dy}{dx} + y = 2 \log_e x \text{ is given by}$$

A. $(\log_e x)^3$

B. $(\log_e x)$

C. $\log_e x$

D. $(\log_3 x)^{\frac{2}{3}}$

Answer:



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25. Number of solutions of the equation

$$\tan x + \sec x = 2 \cos, x, \in \{0, \pi\} \text{ is}$$

A. 0

B. 1

C. 2

D. 3

Answer:



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26. The value of the integral $\int_0^{\frac{\pi}{4}} \frac{\sin x + \cos x}{3 + \sin x} dx$ is equal to

A. $\log_e 2$

B. $\log_e 3$

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

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

Answer:

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27. Let $y = \left(\frac{3^x - 1}{3^x + 1}\right)\sin x + \log_e(1 + x)$, $x > -1$
then at $x = 0$, $\frac{dy}{dx}$ equals

A. 1

B. 0

C. -1

D. -2

Answer:



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28. Maximum value of the function $f(x) = \frac{x}{8} + \frac{2}{x}$ on the interval $[1,6]$ is

A. 1

B. $\frac{9}{8}$

C. $\frac{13}{12}$

D. $\frac{17}{8}$

Answer:



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29. For $-\frac{\pi}{2} < x < \frac{3\pi}{2}$ the value of

$\frac{d}{dx} \left\{ \tan^{-1} \frac{\cos x}{1 + \sin x} \right\}$ is equal to

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

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

C. 1

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

Answer:



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30. The value of the integral $\int_{-2}^2 (1 + 2 \sin x) e^{|x|} dx$ is equal to

A. 0

B. $e^{-2} - 1$

C. $2(e^2 - 1)$

D. 1

Answer:



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31. The maximum value of $|z|$ when the complex number z satisfied the condition $\left| z + \frac{2}{z} \right| = 2$ is

A. $\sqrt{3}$

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

C. $\sqrt{3} + 1$

D. $\sqrt{3} - 1$

Answer:



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32. If $\left(\frac{3}{2} + \frac{\sqrt{3}}{2}\right)^{50} = 3^{25}(x + iy)$ where x and y are

real, then the ordered pair (x,y) is

A. $(-3,0)$

B. $(0,3)$

C. $(0, -3)$

D. $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

Answer:



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33. If $\frac{z - 1}{z + 1}$ is purely imaginary, then

A. $|z| = \frac{1}{2}$

B. $|z| = 1$

C. $|z| = 2$

D. $|z| = 3$

Answer:



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34. There are 100 students in a class. In an examination, 50 of them failed in Mathematics, 45 failed in physics 40 failed in Biology and 32 failed in exactly two of the three subject. Only one student passed in all the subjects. Then the number failing in all the three subjects

A. is 12

B. is 54

C. is 2

D. cannot be determined from the given information

Answer:



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35. A vehicle registration number consists of 2 letters of English alphabet followed by 4 digits, where the first digit is not zero. Then the total number of vehicles with distinct registration number is

A. $26^2 \times 10^4$

B. ${}^{26}P_2 \times {}^{10}P_4$

C. ${}^{26}P_2 \times 9 \times {}^{10}P_4$

D. $26^2 \times 9 \times 10^3$

Answer:



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36. The number of words that can be written using all the letters of the word IRRATIONAL is

A. $\frac{10!}{(2!)^3}$

B. $\frac{10!}{(2!)^2}$

C. $\frac{10!}{2!}$

D. $10!$

Answer:



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37. Four speakers will address a meeting where speaker Q will always speak after speaker P, the the number of ways in which the other of speakers can be prepared is

A. 256

B. 128

C. 24

D. 132

Answer:



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38. The number of diagonals in a regular polygon of 100 sides is

A. 4950

B. 4850

C. 4750

D. 4650

Answer:



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39. Let the coefficients of powers of x in the 2^{nd} and 3^{rd} , and 4^{th} terms in the expansion of

$(1 + x)^n$, where n is a positive integer, be in arithmetic progression. Then the sum of the coefficients of odd powers of x in the expansion is

- A. 32
- B. 64
- C. 128
- D. 256

Answer:



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40. Let $f(x) = ax^2 + bx + c$, $g(x) = px^2 + qx + r$, such that $f(1)=g(1)$, $f(2), g(2)$ and $f(3)-g(3)=2$. Then $f(4)-g(4)$ is

A. 4

B. 5

C. 6

D. 7

Answer:



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41. The sum $1 \times 1! \times 2! + \dots + 50 \times 50!$ equals

A. $51!$

B. $51! - 1$

C. $51! + 1$

D. $2 \times 51!$

Answer:



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42. Six numbers are in A.P in A.P such that their sum is 3.
the first term is 4 times the third term. Then the fifth
term is

A. -15

B. -3

C. 9

D. -4

Answer:



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43. The sum of the infinite series

$$1 + \frac{1}{3} + \frac{1.3}{3.6} + \frac{1.3.5}{3.6.9} + \frac{1.3.5.7}{3.6.9.12} + \dots \text{ is equal to}$$

A. $\sqrt{2}$

B. $\sqrt{3}$

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

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

Answer:



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44. The equation $x^2 + x + a = 0$ and $x^2 + ax + 1 = 0$ have a common real root

- A. for no value of a
- B. for exactly one value of a
- C. for exactly two values of a
- D. for exactly three values of a

Answer:



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45. If 64, 27, 36 are the P^{th} , Q^{th} and R^{th} terms of a G.P. then $P+2Q$ is equal to

A. R

B. 2R

C. 3R

D. 4R

Answer:



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46. If $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \frac{3\pi}{2}$, then the value of $x^9 + y^9 + z^9 - \frac{1}{x^9 y^9 z^9}$ is equal to

A. 0

B. 1

C. 2

D. 3

Answer:



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47. Let p, q, r be the sides opposite to the angles P, Q, R respectively in a triangle PQR if $r^2 \sin P \sin Q = pq$, then the triangle is

A. equilateral

B. acute angled but not equilateral

C. obtuse angled

D. right angled

Answer:



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48. Let p, q, r be the sides opposite to the angles P, Q, R respectively in a triangle PQR if $2pr \sin\left(\frac{P - Q + R}{2}\right)$ equals

A. $p^2 + q^2 + r^2$

B. $p^2 + r^2 - q^2$

$$C. q^2 + r^2 - p^2$$

$$D. p^2 + q^2 - r^2$$

Answer:



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49. Let $P(2, -3)$, $Q(-2, 1)$ be the vertices of the triangle PQR . If the centroid of ΔPQR lies on the line $2x + 3y = 1$ the locus of R is

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

$$B. 2x - 3y = 7$$

$$C. 3x + 2y = 5$$

$$D. 3x - 2y = 5$$

Answer:



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$$50. \lim_{x \rightarrow 0} \frac{\pi^x - 1}{\sqrt{1+x} - 1}$$

A. does not exist

B. equal $\log_e(\pi^2)$

C. equals 1

D. lies between 10 and 11

Answer:





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51. If f is a real-valued differentiable function such that

$f(x)f'(x) < 0$ for all real x , then

- A. $f(x)$ must be an increasing function
- B. $f(x)$ must be a decreasing function
- C. $|f(x)|$ must be an increasing function
- D. $|f(x)|$ must be a decreasing function

Answer:



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52. Rolle's theorem is applicable in the interval $[-2, 2]$ for the function

A. $f(x) = x^3$

B. $f(x) = 4x^4$

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

D. $f(x) = \pi|x|$

Answer:



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53. The solution of

$$25 \frac{d^2 y}{dx^2} - 10 \frac{dy}{dx} + y = 0, y(0) = 1, y(1) = 2e^{1/5} \text{ is}$$

A. $y = e^{5x} + e^{-5x}$

B. $y = (1 + x)^{5x}$

C. $y = (1 + x)e^{\frac{x}{5}}$

D. $y = (1 + x)e^{-\frac{1}{5}}$

Answer:



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54. Let P be the midpoint of a chord joining the vertex of the parabola $y^2 = 8x$ to another point on it. Then the locus of P is

A. $y^2 = 2x$

B. $y^2 = 4x$

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

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

Answer:



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55. The line $x = 2y$ intersects the ellipse $\frac{x^2}{4} + y^2 = 1$ at the points P and Q. the equation of the circle with PQ as diameter is

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

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

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

D. $x^2 + y^2 = \frac{5}{2}$

Answer:



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56. The eccentric angle in the first quadrant of a point on the ellipse $\frac{x^2}{10} + \frac{y^2}{8} = 1$ at a distance 3 units from the centre of the ellipse is

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

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

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

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

Answer:



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57. The transverse axis of hyperbola is along the x-axis and its length is $2a$. The vertex of the hyperbola bisects the line segment joining the centre and the focus the equation of the hyperboal is

A. $6x^2 - y^2 = 3a^2$

B. $x^2 - y^2 = 3a^2$

C. $x^2 - 6y^2 = 3a^2$

$$D. 3x^2 - y^2 = 3a^2$$

Answer:



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58. A point moves in such a way that the difference of its distance from two points $(8,0)$ and $(-8,0)$ always remains 4. then the locus of the point is

- A. a circle
- B. a parabola
- C. an ellipse
- D. a hyperbola

Answer:



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59. The number of integer values of m , for which the x -coordinates of the point of intersection of the lines $3x + 4y = 9$ and $y = nx + 1$ is also an integer, is

A. 0

B. 2

C. 4

D. 1

Answer:



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60. If a straight line passes through the point (α, β) and the portion of the line intercepted between the axes is divided equally at that point then $\frac{x}{\alpha} + \frac{y}{\beta}$ is

A. 0

B. 1

C. 2

D. 4

Answer:



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61. The coefficient of x^{10} in the expansion of $1 + (1 + x) + \dots + (1 + x)^{20}$ is

A. ${}^{19}C_9$

B. ${}^{20}C_{10}$

C. ${}^{21}C_{11}$

D. ${}^{22}C_{12}$

Answer:



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62. Examine the consistency of the system of equations

$$x + y + z = 1$$

$$2x + 3y + 2z = 2$$

$$ax + ay + 2az = 4$$



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63. Let A and B be two events with $P(A^C) = 0.3$, $P(B) = 0.4$ and $P(A \cap B^C) = 0.5$ then $P(B | A \cup B^C)$ is equal to

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

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

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

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

Answer:



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64. Let p, q, r be the altitudes of a triangle with area S and perimeter $2t$. The the value of $\frac{1}{p} + \frac{1}{q} + \frac{1}{r}$ is

A. $\frac{S}{t}$

B. $\frac{t}{S}$

C. $\frac{s}{2t}$

D. $\frac{2S}{t}$

Answer:



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65. Let C_1 and C_2 denote the centres of the circles $x^2 + y^2 = 4$ and $(X - 2)^2 + y^2 = 1$ respectively and let P and Q be their points of intersection. Then the areas of triangles, C_1PQ and C_2PQ are in the ratio

A. 3: 1

B. 5: 1

C. 7: 1

D. 9: 1

Answer:



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66. A straight line through the point of intersection of the lines $x + 2y + 4 = 0$ and $2x + y = 4$ meets the coordinate axes at A and B. The locus of the midpoint of AB is

A. $3(x + y) = 2xy$

B. $2(x + y) = 3xy$

C. $2(x + y) = xy$

D. $2(x + y) = 3xy$

Answer:



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67. Let P and Q be the points on the parabola $y^2 = 4x$ so that the lines semgent PQ subtends right angle at the vertex. If PQ intersects the axis of the parabola at R, then the distance of the vertex from R is

A. 1

B. 2

C. 4

D. 6

Answer:

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68. The incentre of an equilateral triangle is (1,1) and the equation of one side is $3x + 4y + 3 = 0$. Then the equation of the circumcircle of the triangle is

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

B. $x^2 + y^2 - 2x - 2y - 14 = 0$

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

D. $x^2 + y^2 - 2x - 2y + 14 = 0$

Answer:



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69. The value of $\lim_{x \rightarrow \infty} \frac{(n!)^{\frac{1}{n}}}{n}$ is

A. 1

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

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

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

Answer:



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70. The area of the region bounded by the curves

$y = x^3$, $y = \frac{1}{x}$, $x = 2$ is

A. $4 - \log_2 2$

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

C. $3 - \log_e 2$

D. $\frac{15}{4} - \log_e 2$

Answer:



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71. Let y be the solution of the differential equation

$$x \frac{dy}{dx} = \frac{y^2}{1 - y \log x} \text{ satisfying } y(1)=1 \text{ then } y \text{ satisfies}$$

A. $y = x^{y-1}$

B. $y = x^y$

C. $y = x^{y+1}$

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

Answer:



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72. The area of the region bounded by the curves $y = \sin^{-1} x$, $x + x(1 - x)$ and $y = \sin^{-1} x - x(1 - x)$ in the first quadrant, is

A. 1

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

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

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

Answer:



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73. The value of the integral $\int_1^5 [|x - 3| + |1 - x|] dx$ is equal to

A. 4

B. 8

C. 12

D. 6

Answer:



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74. If $f(x)$ and $g(x)$ are twice differentiable functions on $(0,3)$ satisfying

$$f''(x) = g''(x), f'(1) = 4, g'(1) = 6f(2) = 3g(2), = 9$$

then $f(1)-g(1)$ is

A. 4

B. -4

C. 0

D. -2

Answer:



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75. Let $[x]$ denote the greatest integer less than or equal to x , then the value of integral $\int_{-1}^1 (|x| - 2[x] |) dx$ is equal to

A. 3

B. 2

C. -2

D. -3

Answer:

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76. The points representing the complex number z for

which $\arg\left(\frac{z-2}{z+2}\right) = \frac{\pi}{3}$ lie on

- A. a circle
- B. a straight line
- C. an ellipse
- D. a parabola

Answer:

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77. Let a, b, c, p, q, r be positive real numbers such that a, b, c are in G.P and $a^p = b^q = c^r$. Then

- A. p, q, r are in G.P
- B. p, q, r are in A.P
- C. p, q, r are in H.P
- D. p^2, q^2, r^2 are in A.P

Answer:



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78. Let S_k be the sum of an infinite G.P series whose first is k and common ratio is $\frac{k}{k+1}$ ($k > 0$). Then the values

of $\sum_{k=1}^{\infty} \frac{(-1)^k}{S_k}$ is equal to

A. $\log_e 4$

B. $\log_e 2 - 1$

C. $1 - \log_e 2$

D. $1 - \log_e 4$

Answer:



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79. The quadratic equation

$2x^2 - (a^3 + 8a - 1)x + a^2 - 4a = 0$ possesses roots

of opposite sign. Then

A. $a \leq 0$

B. $0 < a < 4$

C. $4 \leq a < 8$

D. $a \geq 8$

Answer:



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80. If $\log_e(x^2 - 16) \leq \log_e(4x - 11)$, then

A. $4 < x \leq 5$

B. $x < -4$ or $x > 4$

C. $-1 \leq x \leq 5$

D. $x < -1$ or $x > 5$

Answer:



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