MATHS

BOOKS - MTG MATHS (BENGALI ENGLISH)

QUESTION PAPER 2009

Multiple Choice Questions

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

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

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

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

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

Answer:

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2. Product of any r consecutive natural numbers is always divisible by

A. $r!$

B. $(r+4)!$

C. $(r+1)!$

D. $(r+2)!$

Answer:

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3. The integrating factor of the differential equation $x \log x \frac{dy}{dx} + y = 2 \log x$ is given by

A. e^x

B. $\log x$

C. $\log(\log x)$

D. x

Answer:

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4. If $x^2 - y^2 = 1$ then

A. $yy' - (2y)^2 + 1 = 0$

B. $(yy')^2 - (y)^2 = 1$

C. $yy' - (y')^2 - 1 = 0$

D. $yy' + 2(y)^2 + 1 = 0$

Answer:

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5. If $c_0, c_1, c_2 \ldots\ldots\ldots c_n$ denote the co-efficients in the expansion of $(1+x)^n$ then the value of $c_1 + 2c_2 + 3c_3 + \ldots\ldots + nc_n$ is

A. $n.2^{n-1}$

B. $(n+1)2^{n-1}$

C. $(n+1)2^n$

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

Answer:

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6. A polygon has 44 diagonals. The number of its sides is

A. 10

B. 11

C. 12

D. 13

Answer:

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7. If α, β be the roots of $x^2 - a(x-1) + b = 0$ then the value of $\frac{1}{\alpha^2 - a\alpha} + \frac{1}{\beta^2 - a\beta} + \frac{2}{a+b}$ is

A. $\frac{4}{a+b}$

B. $\frac{1}{a+b}$

C. 0

D. -1

Answer:

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8. The angle between the lines joining the foci of an ellipse to one particular extremity of the minor axis is 90°. The eccentricity of the ellipse is

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

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

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

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

Answer:

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9. The order of the differential equation $\frac{d^2y}{dx^2} = \sqrt{1 + \left(\frac{dy}{dx}\right)^2}$ is

A. 3

B. 2

C. 1

D. 4

Answer:

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10. The sum of all real of the equation $|x-2|^2+|x-2|-2=0$ is

A. 7

B. 4

C. 1

D. 5

Answer:

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11. If $\int_{-1}^{4} f(x)dx = 4$ and $\int_{2}^{4} \{3 - f(x)\}dx = 7$ then the value of $\int_{-1}^{2} f(x)dx$ is

A. -2

B. 3

C. 4

D. 5

Answer:

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12. For each $n \in N$, $2^{3n} - 1$ is divisible by

A. 7

B. 8

C. 6

D. 16

Answer:

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13. The Rolle's theorem is applicable in the interval $-1 \leq x \leq 1$ for the function

A. f(x)=x

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

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

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

Answer:

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14. The distance covered by a particle in t seconds is given by $x = 3 + 8t - 4t^2$. After 1 second its velocity will be

A. 0 unit/second

B. 3 unit/second

C. 4 unit/second

D. 7 unit/second

Answer:

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15. If $a > 0$ and coefficients of x^5 and x^{15} in the expansion of $\left(x^2 + \frac{a}{x^3}\right)^{10}$ are equal then a=

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

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

C. $\frac{7}{9}$

D. $\frac{9}{7}$

Answer:

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16. The value of $\left(\frac{1}{\log_3 12}+\frac{1}{\log_4 12}\right)$ is

A. 0

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

C. 1

D. 2

Answer:

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17. If $x = \log_a bc, y = \log_b ca, z = \log_c ab,$ then the value of $\frac{1}{1+x} + \frac{1}{1+y} + \frac{1}{1+z}$ will be

A. x+y+z

B. 1

C. $ab + bc + ca$

D. abc

Answer:

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18. Find the approximate value of $\sin 62^\circ$, correct to 3 places of decimale (given, $1^\circ = 0.017$).

A. 0.999

B. 0.998

C. 0.997

D. 0.995

Answer:

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19. The rate of increase of a side of a square is 1 cm/sec. The rate of increase of area of the square, when length of a side of the square is 2 cm, is

A. 10π

B. 20π

C. 200π

D. 400π

Answer:

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20. The quadratic equation whose roots are three times the roots of $3ax^2 + 3bx + c = 0$ is

A. $ax^2 + 3bx + 3c = 0$

B. $ax^2 + 3bx + c = 0$

C. $9ax^2 + 9bx + c = 0$

D. $ax^2 + bx + 3c = 0$

Answer:

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21. Smaller area enclosed by the circle $x^2 + y^2 = 4$ and the line x + y = 2 is

A. $2\tan^{-1}\left(\frac{3}{4}\right)$

B. $\tan^{-1}\left(\frac{4}{3}\right)$

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

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

Answer:

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22. In triangle ABC, a=2, b=3 and $\sin A = \frac{2}{3}$,then B is equal to

A. 30°

B. 60°

C. 90°

D. 120°

Answer:

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

A. $\frac{e^{1000}-1}{e-1}$

B. $\frac{e^{1000}-1}{1000}$

C. $\frac{e-1}{1000}$

D. 1000 (e-1)

Answer:

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24. Let , m be the the smallest positive interger such that the coefficient of x^2 in the expansion of $(1+x)^2+(1+x)^3+....+(1+x)^{49}+(1+mx)^{50}$ is $(3n+1)^{51}C_3$ for some positive integer n . Then the value of n is ,

A. 1

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

C. 2n+1

D. n+1

Answer:

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25. The circles $x^2+y^2-10x+16=0$ and $x^2+y^2=a^2$ intersect at two distinct points if

A. $a<2$

B. $2 < a < 8$

C. $a > 8$

D. a=2

Answer:

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26. $\int \frac{2\sin^{-1} x}{\sqrt{1-x^2}} dx$=

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

B. $\frac{1}{2}\left(\sin^{-1} x\right)^2 + c$

C. $\log\left(\sqrt{1-x^2}\right) + c$

D. $\sin\left(\cos^{-1} x\right) + c$

Answer:

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27. The number of points on the line $x + y = 4$ which are unit distance apart from the line $2x + 2y = 5$ is

A. 0

B. 1

C. 2

D. infinity

Answer:

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28. The value of $\sqrt{2 + \sqrt{2 + \sqrt{2. \ldots \infty}}}$ is

A. $\sec \frac{x}{2}$

B. $\sec x$

C. $\cos ecx$

D. 1

Answer:

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29. If $f(x) = \tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right)$ then the value of $\frac{d}{dx}f(x)$ is-

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

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

C. 1

D. -1

Answer:

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30. If $ab = 2a + 3b, a > 0, b > 0,$ then the minimum value of ab is-

A. $2^{3/2}$

B. $2^{2/3}$

C. $2^{1/3}$

D. $2^{5/3}$

Answer:

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31. If $2\cos 3\theta = 1$, then the value of θ is

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

B. $\frac{\pi}{3}, \cos^{-1}(3/5)$

C. $\cos^{-1}(3/5) \pm \pi$

D. $\frac{\pi}{3}, \pi - \cos^{-1}(3/5)$

Answer:

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32. For any complex number z, the minimum value of $|z| + |z - 1|$ is

A. 0

B. 1

C. 2

D. -1

Answer:

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33. The number of common tangent to two circle $x^2 + y^2 = 4$ and $x^2 + y^2 - 8x + 12 = 0$ is-

A. one pair of common tangents

B. only one common tanget

C. three common tangents

D. no common tangent

Answer:

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34. If C is a point on the line segment joining A (-3, 4) and B (2, 1) such that AC=2BC, then the coordinate of C is

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

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

C. (2,7)

D. (7,2)

Answer:

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35. If a, b, c are real, then both the roots of the equation $(x-b)(x-c)+(x-c)(x-a)+(x-a)(x-b)=0$ are always

A. positive

B. negative

C. real

D. imaginary

Answer:

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36. Find the sum of the following geometric series :

$1+\frac{1}{4}+\frac{1}{16}+\frac{1}{64}+\ldots$ to 10 terms

A. e

B. e^2

C. $\sqrt{e}$

D. $1/e$

Answer:

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37. $A(-2,7), B(7,15), C(-1,-5)$ and $D(h,k)$ are the vertices of a parallelogram and BC is one of its diagonals . Find (h,k) and the angle between its diagonals.

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38. The domain of definition of the function $f(x) = \sqrt{1 + \log_e(1 - x)}$ is

A. $-\infty < x \leq 0$

B. $-\infty < x \leq \frac{e-1}{e}$

C. $-\infty < x \leq 1$

D. $x \geq 1 - e$

Answer:

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39. The value of $\left[\tan^{-1}\frac{m}{n} - \tan^{-1}\left(\frac{m-n}{m+n}\right)\right]$ is -

A. 1

B. 0

C. 2

D. None

Answer:

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40. $\lim_{x \to 2} \frac{\sin\left(e^{x-2} - 1\right)}{\log(x-1)}$

A. 0

B. e

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

D. 1

Answer:

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41. Let $f(x) = \frac{\sqrt{x+3}}{x+1}$ then the value of $Lt_{x \to -3-0} f(x)$ is

A. 0

B. does not exist

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

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

Answer:

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42. $f(x) = x + |x|$ is continuous for

A. $x \in (-\infty, \infty)$

B. $x \in (-\infty, \infty) - \{0\}$

C. only $x > 0$

D. no value of x

Answer:

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43. prove that $\tan\left(\frac{\pi}{4}+\frac{1}{2}\cos^{-1}\frac{a}{b}\right)+\tan\left(\frac{\pi}{4}-\frac{1}{2}\cos^{-1}\frac{a}{b}\right)=\frac{2b}{a}.$

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44. If $i=\sqrt{-1}$ and n is a positive integer, then $i^n+i^{n+1}+i^{n+3}$ is equal to

A. 1

B. i

C. i^n

D. 0

Answer:

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45. $\int \frac{dx}{x(x+1)}$ equals

A. $\ln\left|\frac{x+1}{x}\right| + c$

B. $\ln\left|\frac{x}{x+1}\right| + c$

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

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

Answer:

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46. 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. G.P

B. A.P.

C. H.P.

D. G.P. but not in H.P.

Answer:

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47. A line through the point A (2,0) which makes an angle of 30° with the positive direction of x-axis is rotated about A in clockwise direction through an angle 15°. Then the equation of the straight line in the new position is

A. $\left(2-\sqrt{3}\right)x+y-4+2\sqrt{3}=0$

B. $\left(2-\sqrt{3}\right)x-y-4+2\sqrt{3}=0$

C. $\left(2-\sqrt{3}\right)x-y+4+2\sqrt{3}=0$

D. $\left(2-\sqrt{3}\right)x+y+4+2\sqrt{3}=0$

Answer:

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

A. only one solution

B. two solutions

C. infinitely many solutions

D. no solution

Answer:

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49. The slope at any point of a curve $y = f(x)$ is given by $\frac{dy}{dx} = 3x^2$ and it passes through (-1,1). The equation of the curve is

A. $y = x^3 + 2$

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

C. $y = 3x^3 + 4$

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

Answer:

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50. The modulus of $\frac{1-i}{3+i} + \frac{4i}{5}$ is

A. $\sqrt{5}$ unit

B. $\frac{\sqrt{11}}{5}$ unit

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

D. $\frac{\sqrt{12}}{5}$ unit

Answer:

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51. The equation of the tangent to the conic $x^2 - y^2 - 8x + 2y + 11 = 0$ at (2,1) is

A. x+2=0

B. 2x+1=0

C. x+y+1=0

D. x-2=0

Answer:

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52. A and B are two independent events such that $P(A \cup B') = 0.8$, and $P(A) = 0.3$ .Then P(B) is

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

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

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

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

Answer:

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53. The total number of tangents through the point (3,5) that can be drawn to the ellipses $3x^2 + 5y^2 = 32$ and $25x^2 + 9y^2 = 450$ is

A. 0

B. 2

C. 3

D. 4

Answer:

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

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

B. $\log 2$

C. 0

D. 1

Answer:

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55. A particle is moving in a straight line. At time, the distance between the particle from its starting point is given by $x = t - 6t^2 + t^3$. Its acceleration will be zero at

A. t=1 unit time

B. t = 2 unit time

C. t = 3 unit time

D. t = 4 unit time

Answer:

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56. convert into $A + iB$ form, $\frac{1-i}{3+i} + \frac{4i}{5}$

A. $\frac{1}{190}$

B. $\frac{1}{120}$

C. $\frac{3}{190}$

D. $\frac{5}{190}$

Answer:

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57. The co-ordinates of the foot of the perpendicular from (0, 0) upon the line x+y=2 are

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58. If A is a square matrix then,

A. $A + A^T$ is symmetric

B. AA^T is skew - symmetric

C. $A^T + A$ is skew-symmetric

D. $A^T A$ is skew-symmetric

Answer:

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59. Center of the circle $x^2 + y^2 - 6x + 4y - 12 = 0$ is -

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60. If $A^2 - A + I = 0$ then the inverse of the matrix A is

A. A-I

B. I-A

C. A+I

D. A

Answer:

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61. If C is the reflection of A (2, 4) in x-axis and B is the reflection of C in y-axis, then $|AB|$ is

A. 20

B. $2\sqrt{5}$

C. $4\sqrt{5}$

D. 4

Answer:

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62. 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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63. The value of integral $\int_{-1}^{1} \frac{|x+2|}{x+2} dx$ is

A. 1

B. 2

C. 0

D. -1

Answer:

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64. The line $y = 2t^2$ intersects the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ in real points if

A. $|t| \leq 1$

B. $|t| < 1$

C. $|t| > 1$

D. $|t| \geq 1$

Answer:

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65. General solutio of $\sin x + \cos x = \min_{a \in R} \{1, a^2 - 4a + 6\}$ is

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

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

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

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

Answer:

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66. If A and B ar square matrices of the same order and $AB = 3I$, =then A^{-1} is equal to

A. 3B

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

C. $3B^{-1}$

D. $\frac{1}{3}B^{-1}$

Answer:

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67. The co-ordinates of the focus of the parabola described paraetrically by $x = 5t^2 + 2, y = 10t + 4$ are

A. (7,4)

B. (3,4)

C. (3,-4)

D. (-7,4)

Answer:

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68. For any two sets A and B, A-(A-B) equals

A. B

B. A-B

C. $A \cap B$

D. $A^n \cap B^c$

Answer:

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69. If $a = 2\sqrt{2}, b = 6, A = 45^\circ$ then

A. no triangle is possible

B. one triangle is possible

C. two triangles are possible

D. either no triangle or two triangles are possible

Answer:

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70. A Mapping from IN to N is defined as follows:

$f: lN \to lN$

$f(n) = (n+5)^2, n \in lN$

(IN is the set of natural numbers). Then

A. fis not one-to-one

B. f is onto

C. fis both one-to-one and onto

D. f ' is one-to-one but not onto

Answer:

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71. If in a triangle ABC,$\sin^2 A + \sin^2 B + \sin^2 C = 2$ then the triangle is always

A. equilateral

B. isosceles

C. right angled

D. obtuse angled

Answer:

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72. $\int \frac{dx}{\sin x + \sqrt{3}\cos x}$

A. $\frac{1}{2}\ln\left|\tan\left(\frac{x}{2} - \frac{x}{6}\right)\right| + c$

B. $\frac{1}{2}\ln\left|\tan\left(\frac{x}{4} - \frac{x}{6}\right)\right| + c$

C. $\frac{1}{2}\ln\left|\tan\left(\frac{x}{2} + \frac{x}{6}\right)\right| + c$

D. $\frac{1}{2}\ln\left|\tan\left(\frac{x}{4} + \frac{x}{3}\right)\right| + c$

Answer:

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73. The value of $(1+\cos\pi/6)(1+\cos\pi/3)(1+\cos 2\pi/3)(1+\cos 7\pi/6)$ is

A. $\frac{3}{16}$

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

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

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

Answer:

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74. If $P=\frac{1}{2}\sin^2\theta+\frac{1}{3}\cos^2\theta$ then

A. $\frac{1}{3}\leq P\leq\frac{1}{2}$

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

C. $2 \leq P \leq 3$

D. $-\frac{\sqrt{13}}{6} \leq P \leq \frac{\sqrt{13}}{6}$

Answer:

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75. $\int \frac{dx}{\sin x + \cos x}$ equals

A. $\pi / 4$

B. $\pi / 5$

C. $\pi / 3$

D. $\pi / 6$

Answer:

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76. If $f(x) = f(a - x)$ then $\int_0^a x f(x) dx$ is equal to

A. $\int_0^a f(x) dx$

B. $\frac{a^2}{2} \int_0^a f(x) dx$

C. $\frac{a}{2} \int_0^a f(x) dx$

D. $-\frac{a}{2} \int_0^a f(x) dx$

Answer:

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77. The value of $\int_0^{\infty} \frac{dx}{(x^2 + 4)(x^2 + 9)}$ is

A. $\frac{\pi}{60}$

B. $\frac{\pi}{20}$

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

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

Answer:

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78. If $I_1 \int_0^{\pi/4} \sin^2 x dx$ and $I_2 = \int_0^{\pi/4} \cos^2 x dx$, then,

A. $I_1 = I_2$

B. $I_1 < I_2$

C. $I_1 > I_2$

D. $I_1 = I_2 + \pi/4$

Answer:

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79. The second order derivative of a sin't with respect to a $\cos^3 t$ at $t = \frac{\pi}{4}$ is

A. 2

B. $\frac{1}{12a}$

C. $\frac{4\sqrt{2}}{3a}$

D. $\frac{3a}{4\sqrt{2}}$

Answer:

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80. The smallest value of $\cos\theta + 12$ is

A. 5

B. 12

C. 7

D. 17

Answer:

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