MATHS

BOOKS - MTG MATHS (BENGALI ENGLISH)

QUESTION PAPER 2011

Multiple Choice Questions

1. The eccentricity of the hyperbola $4x^2 - 9y^2 = 36$ is:

A. $\frac{\sqrt{11}}{3}$

B. $\frac{\sqrt{15}}{3}$

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

D. $\sqrt{132}$

Answer:

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2. The length of the latus rectum of the ellipse $16x^2 + 25y^2 = 400$ is:

A. 5/16 unit

B. 32/5 unit

C. 16/5 unit

D. 5/32 unit

Answer:

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3. The vertex of the parabola $y^2 + 6x - 2y + 13 = 0$ is:

A. $(1, -1)$

B. $(-2, 1)$

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

D. $\left(-\frac{7}{2}, 1\right)$

Answer:

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4. The coordinates of a moving point p are $\left(2t^2 + 4, 4t + 6\right)$. Then its locus will be a

A. circle

B. straight line

C. parabola

D. ellipse

Answer:

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5. The equation $8x^2 + 12y^2 - 4x + 4y - 1 = 0$ represents

A. an ellipse

B. a hyperbola

C. a parabola

D. a circle

Answer:

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6. If the straight line y=mx lies outside of the circle $x^2 + y^2 - 20y + 90 = 0$, then the value of m will satisfy

A. $m < 3$

B. $|m| < 3$

C. $m > 3$

D. $|m| > 3$

Answer:

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7. The locus of the centre of a circle which passes through two variable points (a, 0), (-a, 0) is:

A. $x = 1$

B. $x + y = a$

C. $x + y = 2a$

D. $x = 0$

Answer:

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8. The coordinates of the two points lying on x + y = 4 and at a unit distance from the straight line $4x + 3y = 10$ are

A. (-3,1), (7,11)

B. (3,1), (-7,11)

C. (3,1), (7,11)

D. (5, 3), (-1,2)

Answer:

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9. The intercept oil the line y = x by the circle $x^2 + y^2 - 2x = 0$ is AB. Equation of the circle with AB as diameter is

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

B. $x(x-1) + y(y-1) = 0$

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

D. $(x-1)(x-2) + (y-1)(y-2) = 0$

Answer:

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10. If the coordinates of one end of a diameter of the circle $x^2 + y^2 + 4x - 8y + 5 = 0$ is (2,1), the coordinates of ihe other end is

A. $(-6, -7)$

B. $(6, 7)$

C. $(-6, 7)$

D. $(7, -6)$

Answer:

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11. If the three points A(1,6), B(3,-4) and C(x,y) collinear then the equation satisfying by x and y is

A. $5x + y - 11 = 0$

B. $5x + 13y + 5 = 0$

C. $5x - 13y + 5 = 0$

D. $13x - 5y + 5 = 0$

Answer:

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12. If $\sin\theta = \frac{2t}{1+t^2}$ and θ lies in the second quadrant, then $\cos\theta$ is equal to

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

B. $\frac{t^2-1}{1+t^2}$

C. $\frac{-|1-t^2|}{1+t^2}$

D. $\frac{1+t^2}{|1-t^2|}$

Answer:

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13. The solution set of the inequation $\cos^{-1} x < \sin^{-1} x$ is:

A. [-1,1]

B. $\left[\frac{1}{\sqrt{2}}, 1\right]$

C. $[0, 1]$

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

Answer:

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14. The number of solutions of $2\sin x + \cos x = 3$ is:

A. 1

B. 2

C. infinite

D. No solutions

Answer:

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15. Let $\tan\alpha = \frac{a}{a+1}$ and $\tan\beta = \frac{1}{2a+1}$, then $\alpha + \beta$ is:

A. $\pi/4$

B. $\pi/3$

C. $\pi/2$

D. π

Answer:

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16. If $\theta + \phi = \pi/4$, then $(1 + \tan\theta)(1 + \tan\phi)$ is equal to:

A. 1

B. 2

C. $5/2$

D. $1/3$

Answer:

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17. If $\sin\theta$ and $\cos\theta$ are the roots of the equation $ax^2 - bx + c = 0$, then a, b and c satisfy the relation

A. $a^2 + b^2 + 2ac = 0$

B. $a^2 - b^2 + 2ac = 0$

C. $a^2 + c^2 + 2ab = 0$

D. $a^2 - b^2 - 2ac = 0$

Answer:

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18. If A and B are two matrices such that A + B and AB are both defined, then:

A. A and B can be any matrices

B. A, B are square matrices not necessarily of the same order

C. A, B are square matrices of the same order

D. number of columns of A = number of rows of B

Answer:

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19. If $A = \begin{bmatrix} 3 & x-1 \\ 2x+3 & x+2 \end{bmatrix}$ is a symmetric matrix, then the value of x is

A. 4

B. 3

C. -4

D. -3

Answer:

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20. If $Z = \begin{vmatrix} 1 & 1+2i & 5i \\ 1-2i & -3 & 5+3i \\ 5i & 5-3i & 7 \end{vmatrix}$, then $(i = \sqrt{-1})$

A. z is purely real

B. z is purely imaginary

C. $z + \bar{z} = 0$

D. $(z + \bar{z})i$ is purely imaginary

Answer:

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21. The equation of the locus of the point of intersection of the straight lines $x \sin\theta + (1 - \cos\theta)y = a \sin\theta$ and $x \sin\theta - (1 + \cos\theta)y + a \sin\theta = 0$ is:

A. $y = \pm ax$

B. $x = \pm ay$

C. $y^2 = 4ax$

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

Answer:

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22. If $\sin\theta + \cos\theta = 0$ and $0 < \theta < \pi$, then $\theta =$

A. 0

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

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

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

Answer:

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23. The value of $\cos 15^\circ - \sin 15^\circ$ is:

A. 0

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

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

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

Answer:

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24. the period of the function $f(x) = \cos 4x + \tan 3x$ is:

A. π

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

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

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

Answer:

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25. If $y = 2x^3 - 2x^2 + 3x - 5$, then for x=2 and $\Delta x = 0.1$, the value of Δy is:

A. 2.002

B. 1.9

C. 0

D. 0.9

Answer:

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26. The approximate value of $\sqrt[5]{33}$ correct to 4 decimal places is

A. 2.0000

B. 2.1001

C. 2.0125

D. 2.0500

Answer:

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27. The value of $\int_{-2}^{2}(x\cos x+\sin x+1)\,dx$ is

:

A. 2

B. 0

C. -2

D. 4

Answer:

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28. For the function $f(x) = e^{\cos x}$, Rolle's theorem is:

A. applicable when $\frac{\pi}{2} \leq x \leq \frac{3\pi}{2}$

B. applicable when $0 \leq x \leq \frac{\pi}{2}$

C. applicable when $0 \leq x \leq \pi$

D. applicable when $\frac{\pi}{4} \leq x \leq \frac{\pi}{2}$

Answer:

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29. The general solution of the differential equation:

$\frac{d^2y}{dx^2} + 8\frac{dy}{dx} + 16y = 0$ is:

A. $(A + Bx)e^{5x}$

B. $(A + Bx)e^{-4x}$

C. $\left(A + Bx^2\right)e^{4x}$

D. $\left(A + Bx^4\right)e^{4x}$

Answer:

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30. If $x^2 + y^2 = 4$, then $y\frac{dy}{dx} + x$=

A. 4

B. 0

C. 1

D. -1

Answer:

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31. $\int \frac{x^3 dx}{1+x^8} =$

A. $4\tan^{-1} x^3 + c$

B. $\frac{1}{4}\tan^{-1} x^4 + c$

C. $x + 4\tan^{-1} x^4 + c$

D. $x^2 + \frac{1}{4}\tan^{-1} x^4 + c$

Answer:

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32. $\int_{\pi}^{16\pi} |\sin x| dx =$

A. 0

B. 32

C. 30

D. 28

Answer:

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33. The degree and order of the differential equation $y = x\left(\frac{dy}{dx}\right)^2 + \left(\frac{dx}{dy}\right)^2$ are respectively:

A. 1,1

B. 2,1

C. 4,1

D. 1,4

Answer:

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34. $f(x) = \begin{cases} 0 & x = 0 \\ x - 3 & x > 0 \end{cases}$

The function f(x) is:

A. increasing when $x \geq 0$

B. strictly increasing when $x > 0$

C. strictly increasing at $x = 0$

D. not continuous at $x = 0$ and so it is not increasing when $x > 0$

Answer:

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35. The function f(x) = ax + b is strictly increasing for all real x if

A. $a > 0$

B. $a < 0$

C. $a = 0$

D. $a \leq 0$

Answer:

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36. $\int \frac{\cos 2x}{\cos x}$ dx=

A. $2\sin x + \log|\sec x + \tan x| + c$

B. $2\sin x - \log|\sec x - \tan x| + C$

C. $2\sin x - \log|\sec x + \tan x| + C$

D. $2\sin x + \log|\sec x - \tan x| + C$

Answer:

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37. $\int \frac{\sin^8 x - \cos^8 x}{1 - 2\sin^2 x \cos^2 x}\, dx.$

A. $-\frac{1}{2}\sin 2x + C$

B. $\frac{1}{2}\sin 2x + C$

C. $\frac{1}{2}\sin x + C$

D. $-\frac{1}{2}\sin x + C$

Answer:

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38. The general solution of the differential equation $\log_e\left(\frac{dy}{dx}\right) = x + y$ is

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

B. $e^x + e^y = C$

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

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

Answer:

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39. If $y = \frac{A}{x} + Bx^2$, then $x^2 \frac{d^2y}{dx^2}$ =

A. 2y

B. y^2

C. y^3

D. y^4

Answer:

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40. If one of the cube roots of 1 be ω, then

$$\begin{vmatrix} 1 & 1+\omega^2 & \omega^2 \\ 1-i & -1 & \omega^2-1 \\ -i & -1+\omega & -1 \end{vmatrix} =$$

A. ω

B. 1

C. -1

D. 0

Answer:

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41. 4 boys and 2 girls occupy seats in a row at random. Then the probability that the two girls occupy seats side by side is

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

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

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

D. $\frac{1}{6}$

Answer:

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42. A coin is tossed again and again. If tail appears on first three tosses, then the chance that head appears on fourth toss is

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

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

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

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

Answer:

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43. The coefficient of x^n in the expansion of $\frac{e^{7x}+e^x}{e^{3x}}$ is:

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

B. $\frac{4^{n-1}-2^{n-1}}{\lfloor n}$

C. $\frac{4^n-2^n}{\lfloor n}$

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

Answer:

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44. The sum of the series:

$$\frac{1}{1.2} - \frac{1}{2.3} + \frac{1}{3.4} - \frac{1}{4.5} \ldots\ldots\ldots \infty \text{ is:}$$

A. $2\log_e 2 + 1$

B. $2\log_e 2$

C. $2\log_2 2 - 1$

D. $\log_e 2 - 1$

Answer:

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45. The number $(101)^{100} - 1$ is divisible by:

A. 10^4

B. 10^6

C. 10^8

D. 10^{12}

Answer:

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46. If A and B are coefficients of x^n in the expansions of $(1+x)^{2n}$ and $(1+x)^{2n-1}$ respectively, men A/B is equal to

A. 4

B. 2

C. 9

D. 6

Answer:

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47. If $n > 1$ is an integer and $x \neq 0$, then $(1+x)^n - nx - 1$ is divisible by:

A. nx^3

B. n^3x

C. x

D. nx

Answer:

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48. If ${}^{n}C_4, {}^{n}C_5$ and ${}^{m}C_6$ are in A.P., then n is:

A. 7 or 14

B. 7

C. 14

D. 14 or 21

Answer:

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49. The number of diagonals in a polygon is 20. The number of sides of the polygon is:

A. 5

B. 6

C. 8

D. 10

Answer:

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50. ${}^{15}C_3 + {}^{15}C_5 + \ldots\ldots + {}^{15}C_{15} =$

A. 2^{14}

B. $2^{14} - 15$

C. $2^{14} + 15$

D. $2^{14} - 1$

Answer:

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51. Let a, b, c be three real numbers such that a + 2b + 4c = 0. Then the equation $ax^2 + bx + c = 0$

A. has both the roots complex

B. has its roots lying within $-1 < x < 0$

C. has one of the roots equal to $\frac{1}{2}$

D. has its roots lying within $2 < x < 6$

Answer:

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52. If the ratio of the roots of the equation $px^2 + qx + r = 0$ is a:b, then $\frac{ab}{(a+b)^2}$=

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

B. $\frac{pr}{q^2}$

C. $\frac{q^2}{pr}$

D. $\frac{pq}{r^2}$

Answer:

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53. If α and β are the roots of the equation $x^2 + x + 1 = 0$, then me equation whose roots are α^{19} and β^7 is:

A. $x^2 - x - 1 = 0$

B. $x^2 - x + 1 = 0$

C. $x^2 + x - 1 = 0$

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

Answer:

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54. For the real parameter t, the locus of the complex number:

$z = \left(1 - t^2\right) + i\sqrt{1 + t^2}$, in the complex plane is:

A. an ellipse

B. a parabola

C. a circle

D. a hyperbola

Answer:

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55. If $x + \frac{1}{x} = 2\cos\theta$, then for any integer n, $x^n + \frac{1}{x^n}$ =

A. $2\cos n\theta$

B. $2\sin n\theta$

C. $2i\cos n\theta$

D. $2i\sin n\theta$

Answer:

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56. If $\omega \neq 1$ is a cube root of unity, then the sum of the series

$S = 1 + 2\omega + 3\omega^2 + \ldots\ldots + 3n\omega^{3n-1}$ is:

A. $\frac{3n}{\omega - 1}$

B. $3n(\omega - 1)$

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

D. 0

Answer:

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57. If $\log_3 x + \log_3 y = 2 + \log_3 2$ and $\log_3(x + y) = 2$, then

A. $x = 1, y = 8$

B. $x = 8, y = 1$

C. $x = 3, y = 6$

D. $x = 9, y = 3$

Answer:

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58. If $\log_7 2 = \lambda$, then the value of $\log_{49}(28)$ is:

A. $(2\lambda + 1)$

B. $(2\lambda + 3)$

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

D. $2(2\lambda + 1)$

Answer:

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59. The sequence $\log a, \log\left(\frac{a^2}{b}\right), \log\left(\frac{a^3}{b^2}\right)$ is:

A. a G.P.

B. an A.P.

C. a H.P.

D. both a G.P. and a H.P.

Answer:

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60. If in a triangle ABC, sin A, sin B, sin C are in A.P, then

A. the altitudes are in A.P

B. the altitudes are in H.P.

C. the angles are in A.P.

D. the angles are in H.P.

Answer:

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61. $\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix} =$

A. 0

B. -1

C. 1

D. 2

Answer:

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62. The area enclosed between $y^2 = x$ and $y = x$ is:

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

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

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

D. $\frac{1}{6}$ sq. units

Answer:

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63. Let $f(x) = x^3 e^{-3x}, x > 0$. Then the maximum value of $f(x)$ is:

A. e^{-3}

B. $3e^{-3}$

C. $27e^{-9}$

D. ∞

Answer:

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64. The area bounded by $y^2 = 4x$ and $x^2 = 4y$ is:

A. $\frac{20}{3}$ sq. units

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

C. $\frac{14}{3}$ sq. units

D. $\frac{10}{3}$ sq. units

Answer:

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65. The acceleration of a particle starting from rest moving in a straight line with uniform acceleration is $8m/\sec^2$. The time taken by the particle to move the second metre is:

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

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

C. $\left(1+\sqrt{2}\right)$ sec

D. $\left(\sqrt{2}-1\right)$ sec

Answer:

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66. The solution of:

$$\frac{dy}{dx} = \frac{y}{x} + \frac{\tan y}{x}$$ is:

A. $x = c\sin(y/x)$

B. $x = c\sin(xy)$

C. $y = c\sin(y/x)$

D. $xy = c\sin(x/y)$

Answer:

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67. Integrating Factor (I.F). Of the differential equation:

$$\frac{dy}{dx} - \frac{3x^2}{1+x^3}y = \frac{\sin^2 x}{1+x}$$ is:

A. e^{1+x^3}

B. $\log\left(1+x^3\right)$

C. $1+x^3$

D. $\frac{1}{1+x^3}$

Answer:

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68. The differential equation of $y = ae^{bx}$ (a & b are parameters) is:

A. $yy_1 = y_2^2$

B. $yy_2 = y_1^2$

C. $yy_1^2 = y_2$

D. $yy_2^2 = y_1$

Answer:

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69. The value of:

$$\lim_{n \to \infty} \sum_{r=1}^{n} \frac{r^2}{r^3 + n^3} \text{ is:}$$

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

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

C. $\frac{1}{3}\log_e 2$

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

Answer:

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70. The value of $\int_0^{\pi} \sin^{50} x \cos^{49} x dx$ is:

A. 0

B. $\pi/4$

C. $\pi/2$

D. 1

Answer:

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71. $\int 2^x [f'(x) + f(x)(\log 2)]dx$ is

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

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

C. $2^x (\log 2) f(x) + C$

D. $(\log 2) f(x) + C$

Answer:

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72. Let $f(x) = \tan^{-1} x$. Then $f'(x) + f''(x)$ is =0, when x is equal to:

A. 0

B. ± 1

C. 1

D. $-i$

Answer:

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73. If $y = \tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$, then $y'(1)$

=

A. $1/4$

B. $1/2$

C. $-1/4$

D. $-1/2$

Answer:

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74. The value of $\lim_{x \to 1} \frac{x + x^2 + \ldots . + x^n - n}{x - 1}$ is:

A. n

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

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

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

Answer:

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75. $\lim_{x \to 0} \frac{\sin\left(\pi \sin^2 x\right)}{x^2} =$

A. π^2

B. 3π

C. 2π

D. π

Answer:

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76. If the function:

$$f(x) = \begin{cases} \dfrac{x^2 - (A+2)x + A}{x-2} & \text{for} \quad x \neq 2 \\ 2 & \text{for} \quad x = 2 \end{cases}$$ is

continous at x=2, then

A. A=0

B. A=1

C. A=-1

D. A=2

Answer:

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77. $f(x) = \begin{cases} [x] + [-x] & \text{when} \quad x \neq 2 \\ \lambda & \text{when} \quad x = 2 \end{cases}$, If f(x) is continous at x=2, the value of λ will be:

A. -1

B. 1

C. 0

D. 2

Answer:

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78. The even function of the following is:

A. $f(x) = \dfrac{a^x + a^{-x}}{a^x - a^{-x}}$

B. $f(x) = \dfrac{a^x + 1}{a^x - 1}$

C. $f(x) = x.\dfrac{a^x - 1}{a^x + 1}$

D. $f(x) = \log_2\left(x + \sqrt{x^2 + 1}\right)$

Answer:

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79. If $f(x+2y, x-2y) = xy$, then $f(x, y)$ is equal to:

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

B. $\frac{1}{4}(x^2 - y^2)$

C. $\frac{1}{8}(x^2 - y^2)$

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

Answer:

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80. The locus of the middle points of all chords of the parabola, $y^2 = 4ax$ passing through the vertex is:

A. a straight line

B. an ellipse

C. a parabola

D. a circle

Answer:

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