MATHS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

PRACTICE SET 21

Paper 2 Mathematics

1. If one end of the diameter is (1, 1) and the other end lies on the line $x + y = 3$, then

find the locus of the center of the circle.

A. $x + y = 3,$ is

B. $x + y = 1$

C. $2(x - y) = 5$

D. none of the above

Answer: C

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2. The centre of a circle passing through the points (0, 0), (1, 0) and touching the circle $x^2 + y^2 = 9$, is

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

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

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

D. $\left(2^{1/2}, -2^{1/2}\right)$

Answer: D

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3. If $|a| = |b|, then (a+b) \cdot (a-b)$ is

A. positive

B. negative

C. zero

D. None of these

Answer: C

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4. "The maximum or the minimum of the objective function occurs only at the corner points of the feasible region". This theorem is know as fundamental theorem of

A. Agebra

B. Arithmetic

C. Calculus

D. Extreme points

Answer: D

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5. The possiblility that a non-leap year has 53 sundays, is

A. $1/7$

B. $2/7$

C. $3/7$

D. $4/7$

Answer: A

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6. The number of common tangents to the circles $x^2 + y^2 - y = 0$ and $x^2 + y^2 + y = 0$ is

A. 2

B. 3

C. 0

D. 1

Answer: B

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7. The speed v of a particle moving along a straight line is given by $a + bv^2 = x^2$, where x is its distance from the origin. The acceleration of the particle is

A. bx

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

C. $\frac{x}{b}$

D. $\frac{x}{ab}$

Answer: C

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8. The area bounded by the curve $|x| + |y| = 1$ and axis of x, is given by

A. 2sq unit

B. 1 sq unit

C. 4 sq unit

D. None of these

Answer: A

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9. The integrating factor of the differential equation $\frac{dy}{dx}\left(x(\log)_e x\right) + y = 2(\log)_e x$ is given by (a) $(b)x(c)$ (d) (b) $(e)(f)(g)e^{(h)x(i)}(j)(k)$ (l) (c) $(m)(n)(o)((p)\log)_q e(r)(s)x(t)$ (u) (d) *[Math Processing Error]* (ii)

A. log (log x)

B. e^x

C. $\log x$

D. x

Answer: C

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10. The sum of n terms of two arithmetic progressions are in the ratio 2n+3:6n+5, then the ratio of their 13th terms, is

A. $53:155$

B. $27:87$

C. $29:83$

D. $31:89$

Answer: A

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11. Dual of $(x \vee y) \wedge (x \vee 1) = x \vee x \wedge y \vee y$ is

A. $(x \cdot y) + (x \cdot 0) = x)(x + y) \cdot y$

B. $(x + y) + (x \cdot 1) = x \cdot (x + y) \cdot y$

C. $(c \cdot y) \cdot (x \cdot 0) = x \cdot (x + y) \cdot y$

D. None of these above

Answer: A

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12. The sum o f series $1 + \frac{4}{5} + \frac{7}{5^2} + \frac{10}{5^3} + \infty$ is $7/16$ b. $5/16$ c. $104/64$ d. $35/16$

A. $\frac{16}{35}$

B. $\frac{11}{8}$

C. $\frac{35}{16}$

D. $\frac{7}{16}$

Answer: C

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13. The value of $\int_{-\pi/4}^{\pi/4} x^3 \sin^4 x dx$ is equal to

A. 1

B. 2

C. 0

D. None of these

Answer: C

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14. If $x = a\sin\theta$ and $y = b\cos\theta$, $then \frac{d^2y}{dx^2}$ is

A. $\frac{a}{b^2}\sec^2\theta$

B. $\frac{-b}{b}\sec^2\theta$

C. $\frac{b}{a^2}\sec^3\theta$

D. $\frac{-b}{a^2}\sec^3\theta$

Answer: D

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15. If $x = a\sin\theta$ and $y = b\cos\theta$, $then\frac{d^2y}{dx^2}$ is

A. $\frac{5}{36}$

B. $\frac{1}{9}$

C. $\frac{2}{9}$

D. $\frac{19}{36}$

Answer: C

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16. The plane x-2y+z-6=0 and the line x/1=y/2=z/3` are related as the line (A) meets the plane obliquely (B) lies in the plane (C) meets at righat angle to the plane (D) parallel to the plane

A. parallel to the plane

B. at right to the plane

C. lies in the plane

D. meets the plane obliquel

Answer: A

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17. The direction consines of the line segment joining points $(-3, 1, 2)$ and $(1, 4, -10)$ is

A. $\frac{4}{13}, \frac{3}{13}, \frac{-12}{13}$

B. $\frac{-4}{13}, \frac{3}{13}, -\frac{12}{13}$

C. $\frac{-4}{13}, \frac{-3}{13}, \frac{12}{13}$

D. None of these

Answer: A

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18. The focal distance of a point on the parabola $y^2 = 12\xi s4$. Find the abscissa of this point.

A. 2

B. 3

C. -1

D. 1

Answer: D

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19. The equation of a line passing through $(2, -3)$ and inclined at an angle of 135° with the positive direction of X-axis is

A. $x + y - 1 = 0$

B. $x + y + 1 = 0$

C. $x - y - 1 = 0$

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

Answer: B

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20. Which of the following is a contradiction ?

A. $(p \wedge q) \wedge \sim(p \vee q)$

B. $p \vee (\sim p \wedge q)$

C. $(p \Rightarrow q) \Rightarrow p$

D. None of these

Answer: A

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21. Inverse of the matrix $\begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$ is

A. $\begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$

B. $\begin{bmatrix} \cos 2\theta & \sin 2\theta \\ \sin 2\theta & -\cos 2\theta \end{bmatrix}$

C. $\begin{bmatrix} \cos 2\theta & \sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$

D. $\begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$

Answer: D

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22. Let $\vec{a}$ and $\vec{b}$ be the two unit vectors such that angle between them is 60°. Then $\left|\vec{a} - \vec{b}\right|$ is equal to: (a) $\sqrt{5}$ (b) $\sqrt{3}$ (c) 0 (d) 1 (e) $\sqrt{2}$

A. $\sqrt{5}$

B. $\sqrt{3}$

C. 0

D. 1

Answer: D

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23. Which of the follwing statement is correct ?

A. Every LPP admits an optimal solution

B. A LLP admits a unique solution

C. If a LPP admits two optimal solutions, then it has an infinites number of optimal solution

D. A LPP admits two optimal solutions

Answer: C

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24. If $x = A\cos 4t + B\sin 4t$, then $\frac{d^2x}{dt^2}$ is equal to

A. $-16x$

B. $16x$

C. x

D. $-x$

Answer: A

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25. $\int 32x^3(\log x)^2$ dx is equal ot

A. $8x^4(\log x)^2 + c$

B. $x^4\left\{8(\log x)^2 - 4\log x + 1\right\} + c$

C. $x^4\left\{8(\log x)^2 - 4\log x\right\} + c$

D. $x^3\left\{(\log x)^2 + 2\log x\right\} + x$

Answer: B

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26. Solution of the differential equation x dy -y dx = 0 represents-

A. a parabola whose vertex is at origin

B. a circle whose centre is at origin

C. a rectangular hyperbola

D. a straight line passing through origin

Answer: B

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27. Which of the following is correct ?

A. $A \cap \phi = A$

B. $A \cap \phi = \phi$

C. $A \cap \phi = U$

D. $A \cap \phi = A'$

Answer: b

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28. The corresponding Boolena Expression is

A. $(x_1 + x_2)'(x_3 + x_4)'$

B. $(x_1 x_2)' + (x_3 x_4)'$

C. $(x_1 + x_2) \cdot (x_3 + x_4)'$

D. $(x_1 x_2{}' + (x_3 \cdot x_4)$

Answer: A

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29. If $f(x) = x + 2, \quad \text{then} \quad f'(f(x)) \quad \text{at} \quad x = 4,$ is

A. 8

B. 1

C. 4

D. 5

Answer: B

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30. The period of the function $f(x) = |\sin 2x| + |\cos 8x|$ is

A. 2π

B. π

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

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

Answer: D

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31. The circle $x^2 + y^2 - 10x - 14y + 24 = 0$

cuts an intercepts on y-axis of length

A. 5

B. 10

C. 1

D. None of these

Answer: B

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32. The number of solutions of the following equations

$x_2 - x_3 = 1, \ -x_1 + 2x_3 = \ -2, x_1 - 2x_2 = 3$

is

A. zero

B. one

C. two

D. infinite

Answer: A

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33. Number of tangents from $(7, 6)$ to ellipse $\frac{x^2}{16} + \frac{y^2}{25} = 1$ is

A. 0

B. 1

C. 2

D. None of these

Answer: C

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34. The maximum value of Z =x +3y such that $2x + y \leq 20, x + 2y \leq 20, x \geq 0, y \geq 0$ is

A. 10

B. 60

C. 30

D. None of these

Answer: C

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35. Which of the following statements is not correct for the R by aRb if and only if b lives within one kilometer from a (a) R is reflexive (b) R is symmetric (c) R is not anti-symmetric (d) None of the above

A. R is reflexivve

B. R is symmetric

C. R is anti-symmetric

D. none of the above

Answer: C

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36. if $2^x + 2^y = 2^{x+y}$ then the value of $\frac{dy}{dx}$ at $x = y = 1$

A. 0

B. -1

C. 1

D. 2

Answer: B

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37. Let f be a function defined for all $x \in R$. If f is differentiable and $f\left(x^3\right) = x^5$ for all $x \in R(x \neq 0)$, then the value of $f'(27)$ is-

A. 15

B. 45

C. 0

D. None of these

Answer: A

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38. $\int x^2 \sin x dx$ is equal to

A. $-x^2 \cos x + 2[x \sin x + \sin x] + c$

B. $-x^2 \cos x + \frac{1}{2}[x \sin x + \sin x] + c$

C. $-x^2 \cos x + 2[x \sin x + \cos x] + c$

D. $-x^2 \cos x + \frac{1}{2}[x \sin x + \cos x] + c$

Answer: C

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39. The solution of the differential equation

$ye^{x/y}dx = \left(xe^{x/y} + y^2 \sin y\right)dy$ is

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

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

C. $e^{x/y} = \cos y - c$

D. $e^{y/x} = \cos y + c$

Answer: A

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40. If

$a = \hat{i} + 2\hat{j} + 2\hat{k}$ and $b = 3\hat{i} + 6\hat{j} + 2\hat{k}$,

then the vector in the direction of a and having magnitude as b is

A. $7\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$

B. $\frac{7}{9}\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$

C. $\frac{7}{3}\left(\hat{i} + 2\hat{j} + 2\hat{k}\right)$

D. None of these

Answer: C

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41. The element in the first row and third column of the inverse of the matrix $\begin{bmatrix} 1 & 2 & -3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$ is

A. -2

B. 0

C. 1

D. 7

Answer: D

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42. The foci of an ellipse are $(0, \pm 4)$ and the equations for the directtices are $y = \pm 9$. The equation for the ellipse is

A. $5x^2 + 9y^2 = 4$

B. $2x^2 - 6y^2 = 28$

C. $6x^2 + 3y^2 = 45$

D. $9x^2 + 5y^2 = 180$

Answer: D

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43. $\lim_{x \to a} \frac{x^m - a^m}{x^n - a^n}$ is equal to

A. mna^{m-n}

B. $\frac{m}{n}a^{m-n}$

C. $\frac{n}{m}a^{m-n}$

D. mna^{m+a}

Answer: B

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44. The area of the triangle having vertices as $\hat{i} - 2\hat{j} + 3\hat{k}, \ -2\hat{i} + 3\hat{j} - \hat{k}, 4\hat{i} - 7\hat{j} + 7\hat{k}$ is

A. 36 sq unit

B. 0 sq unit

C. 39 sq unit

D. 11 sq unit

Answer: B

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45. if $y = \sec\left(\tan^{-1} x\right)$ then $\frac{dy}{dx}$ is

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

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

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

D. None of these

Answer: A

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46. $\int \frac{xdx}{x^2+4x+5}$ is equal to

A. $\frac{1}{2}\log\left(x^2+4x+5\right)+2\tan^{-1}(x)+c$

B. $\frac{1}{2}\log\left(x^2+4x+5\right)\tan^{-1}(x)+c$

C.

$$\frac{1}{2}\log\left(x^2+4x+5\right)+\tan^{-1}(x+2)+c$$

D.

$$\frac{1}{2}\log\left(x^2+4x+5\right)-2\tan^{-1}(x+2)+c$$

Answer: D

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47. $\lim_{x \to 0} \frac{x}{\tan^{-1} 2x}$ is equal to

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

B. ∞

C. 0

D. 1

Answer: A

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48. The angle between the tangents drawn from the point $(1, 4)$ to the parabola $y^2 = 4x$ is

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

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

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

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

Answer: C

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49. $\int_{\frac{1}{2}}^{2} \frac{1}{x} \sin^{101}\left(x - \frac{1}{x}\right) dx =$

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

B. 1

C. 0

D. $\frac{101}{2}$

Answer: C

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50. Let a, b, c be three non-zero vectors which are pairwise non-collinear. If $a + 3b$ is collinear with cand c and $b + 2c$ is collinear with a, then $a + b + 6c$ is

A. λa

B. λb

C. λc

D. 0

Answer: D

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