MATHS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

PRACTICE SET 09

Paper 2 Mathematics

1. Distance between the pair of lines represented by the equation $x^2 - 6xy + 9y^2 + 3x - 9y - 4 = 0$, is

A. $\frac{15}{\sqrt{10}}$

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

C. $\sqrt{\frac{5}{2}}$

D. $\frac{1}{\sqrt{10}}$

Answer: C

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2. The optimal value of the objective function is attained at the points

A. given by intersectionn of inequations with axis only

B. given by intersection of inequations with X-axis only

C. given by corner points of the feasible region

D. none of the above

Answer: C

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3. For how many values of 'x' in the closed interval $[-4, -1]$ is the matrix $\begin{bmatrix} 3 & -1+x & 2 \\ 3 & -1 & x+2 \\ x+3 & -1 & 2 \end{bmatrix}$ singular ? (A) 2 (B) 0 (C) 3 (D) 1

A. 2

B. 0

C. 3

D. 1

Answer: D

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4. If $3x_1 + 5x_2 \leq 15, 5x_1 + 2x_2 \leq 10, x_1, x_2 \geq 0,$ then the maximum value of $z = 5x_1 + 3x_2$ by graphical method is

A. $12\frac{7}{19}$

B. $12\frac{1}{7}$

C. $12\frac{3}{5}$

D. 12

Answer: A

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5. If the position vector of a point A is $\vec{a} + 2\vec{b}$ and $\vec{a}$ divides AB in the ratio $2:3$, then the position vector of B, is

A. $2a - b$

B. $b - 2a$

C. $a - 3b$

D. b

Answer: C

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6. The value of $\int e^{2x}(2\sin 3x + 3\cos 3x)dx$ is

A. $e^{2x}\sin 3x + c$

B. $e^{2x}\cos 3x + c$

C. $e^{2x} + c$

D. $e^{2x}(2\sin 3x) + c$

Answer: A

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7. $\lim_{\alpha \to \beta}\left[\frac{\sin^2\alpha - \sin^2\beta}{\alpha^2-\beta^2}\right]$ is equal to

A. 0

B. 1

C. $\frac{\sin\beta}{\beta}$

D. $\frac{\sin 2\beta}{2\beta}$

Answer: D

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8. Area enclosed between the curve $y^2(2a - x) = x^3$ and line $x = 2a$ above X-axis is (a) πa^2 sq units (b) $\frac{3\pi a^2}{2}$ sq units (c) $2\pi a^2$ sq units (d) $3\pi a^2$ sq units

A. πa^2 sq unit

B. $\frac{3\pi a^2}{2}$ sq unit

C. $2\pi a^2$ sq unit

D. $3\pi a^2$ sq unit

Answer: B

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9. The minimum value of $x^2 + \dfrac{1}{1+x^2}$ is at

A. $x = 0$

B. $x = 1$

C. $x = 4$

D. $x = 3$

Answer: A

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10. A continuously differentiable function $\phi(x)$ in $(0, \pi)$ satisfying $y' = 1 + y^2$, $y(0) = 0 = y(\pi)$ is

A. tanx

B. $x(x - \pi)$

C. $(x - \pi)(1 - e^x)$

D. Not possible

Answer: D

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11. The tangent to the curve $y = e^{2x}$ at the point (0,1) meets X-axis at

A. $\left(\frac{1}{2}, 0\right)$

B. $\left(-\frac{1}{2}, 0\right)$

C. $(2, 0)$

D. (0,0)

Answer: B

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12. A ladder 10 m long rests against a vertical wall with the lower end on the horizontal ground. The lower end of the ladder is pulled along the ground away from the wall at the rate of 3 m/s. The height of the upper end while it is descending at the rate of 4 m/s, is

A. $4\sqrt{3}m$

B. $5\sqrt{3}m$

C. $6m$

D. 8 m

Answer: C

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13. The value of $\cos^2\left(\frac{\pi}{4}+\theta\right)-\sin^2\left(\frac{\pi}{4}-\theta\right)$ is

A. 0

B. $\cos\theta$

C. $\sin 2\theta$

D. $\cos\theta$

Answer: A

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14. The diameters of a circle are along $2x+y-7=0$ and $x+3y-11=0$.Then the equation of this circle, whichalso passes through (5, 7) is

A. $x^2+y^2-4x-6y-16=0$

B. $x^2+y^2-4x-6y-20=0$

C. $x^2 + y^2 - 4x - 6y - 12 = 0$

D. $x^2 + y^2 + 4x + 6y - 12 = 0$

Answer: C

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15. The locus of the mid point of a chord of the circle $x^2 + y^2 = 4$ which subtends a right angle at the origin is

A. x+y=2

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

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

D. $x + y = 1$

Answer: C

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16. If the length of the major axis of the ellipse $\left(\frac{x^2}{a^2}\right) + \left(\frac{y^2}{b^2}\right) = 1$ is three times the length of minor axis, its accentricity is

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

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

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

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

Answer: D

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17. If a normal chord at a point on the parabola $y^2 = 4ax$ subtends a right angle at the vertex, then t equals

A. 1

B. $\sqrt{2}$

C. 2

D. $\sqrt{3}$

Answer: B

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18. Two cards drawn without replacement from a well shuffled pack of 52 cards. Find the probability that cards drawn are aces.

A. $\frac{2}{13}$

B. $\frac{1}{51}$

C. $\frac{1}{221}$

D. $\frac{2}{21}$

Answer: C

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19. If the curve $y = a^x$ and $y = b^x$ intersect at angle α, then $\tan \alpha =$

A. $\dfrac{a-b}{1+ab}$

B. $\dfrac{\log a - \log b}{1 + \log a \log b}$

C. $\dfrac{1+b}{1-ab}$

D. $\dfrac{\log a + \log b}{1 - \log a \log b}$

Answer: B

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20. In a boolean algebra B, for all x,y in B, $x \cdot (x + y)$ is equal to

A. y

B. x

C. 1

D. 0

Answer: B

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21. If angle between two unit vectors $\vec{a}$ and $\vec{b}$ is θ then $\sin\left(\frac{\theta}{2}\right)$ is equal to

A. $|a-b|/2$

B. $|a+b|/2$

C. $|a-b|$

D. $|a+b|$

Answer: A

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22. The equation of the curve through the point (1,0) which satisfies the differential equatoin $(1+y^2)dx - xydy = 0$, is

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

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

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

D. None of these

Answer: B

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23. If

$P(A \cap B) = 1/3, P(A \cup B) = 5/6$ and $P(A) = 1/2$

, then which one of the following is correct ?

A. A and B are independent events

B. A and B are mutually exclusive events

C. P(A)=P(B)

D. None of the above

Answer: A

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24. If p and q are tow statements, then $\sim(p \wedge q) \vee \sim(q \Leftrightarrow p)$ is

A. tautology

B. contradiction

C. neigher tautology nor contradiction

D. Eigher tautology or contradiction

Answer: C

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25. The function f defined by

$f(x) = x^3 - 6x^2 - 36x + 7$ is increasing , if

A. xgt2 and also xgt6

B. xgt2 annd also x $<$ 6

C. $x < \; - 2$ and also $x < 6$

D. $x < \; - 2$ and also $x > 6$

Answer: D

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26. Sum the following series to infinity :

$$\frac{\tan^{-1}1}{1+1+1^2}+\frac{\tan^{-1}1}{1+2+2^2}+\frac{\tan^{-1}1}{1+3+3^2}+\,..$$

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

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

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

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

Answer: A

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27. Solution of the differential equation

$\cos x dy = y(\sin x - y)dx, 0 < x < \frac{\pi}{2}$ is

A. $\sec x = (\tan x + c)y$

B. $y \sec x = \tan x + c$

C. $y \tan x = \sec x + c$

D. $\tan x = (\sec x + c)y$

Answer: A

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28. The value of the integral $\int e^x \left(\frac{1-x}{1+x^2}\right)^2 dx$ is

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

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

C. $\frac{e^{x}}{1+x^{2}}+c$

D. $e^{x}(1-x)+c$

Answer: C

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29. Which one of the following isnot true always?

A. if f(x) is not continuous at x=a, then it is not differentiable at x=a

B. if f(x) is continuous at x=a, then it is differentiable at x=a

C. if f(x) and g(x) are differentiable at x=a, then f(x)+g(x) is also differentiable at x=a

D. if a function f(x) is continuous at x=a, then $\lim_{a \to a} f(x)$ exists

Answer: B

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30. If f is a real-valued differentiable function satisfying

$|f(x) - f(y)| \leq (x - y)^2, x, y \in R$ and $f(0) = 0$,

then $f(1)$ equals:

A. 1

B. 2

C. 0

D. -1

Answer: C

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31. The most general of θ satisfying $\tan\theta + \tan\left(\frac{3\pi}{4} + \theta\right) = 2$ are given by

A. $2n\pi \pm \frac{\pi}{3}, n \in Z$

B. $n\pi + \frac{\pi}{3}, n \in Z$

C. $2n\pi \pm \frac{\pi}{6}, n \in Z$

D. $n\pi \pm \frac{\pi}{6}, n \in Z$

Answer: B

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32. The value of $\int_1^2 \frac{dx}{(x+1)\sqrt{x^2-1}}$ is

A. 1

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

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

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

Answer: B

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33. Focus of hyperbola is $(\pm 3, 0)$ and equation of tangent is $2x + y - 4 = 0$, find the equation of hyperbola is

A. $4x^2 - 5y^2 = 20$

B. $5x^2 - 4y^2 = 20$

C. $4x^2 - 5y^2 = 1$

D. $5x^2 - 4y^2 = 1$

Answer: A

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34. If the line px-qy=r intersects the coordinate axes at (a,0) and (0,b), then the value of a+b is equal to

A. $r\left(\frac{q+p}{pq}\right)$

B. $r\left(\frac{q-p}{pq}\right)$

C. $r\left(\frac{p-q}{pq}\right)$

D. $r\left(\frac{p+q}{p-q}\right)$

Answer: B

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35. The lines (a+2b)x+(a-3b)y=a-b for different values of a and b pass through the fixed point , whose coordinates are

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

B. $\left(\frac{3}{5}\frac{3}{5}\right)$

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

D. $\left(\frac{2}{5}, \frac{3}{5}\right)$

Answer: D

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36. If P is a point (x, y) on the line $y = -3x$ such that P and the point (3, 4) are on the opposite sides of the line $3x - 4y = 8$, then $x > \frac{8}{15}$ (b) $x > \frac{8}{5}$ $y < -\frac{8}{5}$ (d) $y < -\frac{8}{15}$

A. $x > \frac{8}{15}, y < -\frac{8}{5}$

B. $x > \frac{8}{5}, y < -\frac{8}{15}$

C. $x = \frac{8}{15}, y = -\frac{8}{5}$

D. None of these

Answer: A

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37. If the fifth term of a G.P. is 2, then write the product of its 9 terms.

A. 256

B. 512

C. 1024

D. None of these

Answer: B

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38. If $f(x)=\int_{-1}^{x}|t|dt$, then for any $x \geq 0, f(x)$ is equal to

A. $1-x^2$

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

C. $1+x^2$

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

Answer: B

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39. Let $f: R \rightarrow R$ be defined by

$$f(x)=\begin{cases} 2k-2x, & \text{if } x \leq -1 \\ 2x+3, & \Leftrightarrow x > -1 \end{cases}$$

If f has a local minimum at x=-1, then a possible value of k is

A. 1

B. 0

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

D. -1

Answer: D

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40. If the error committed in measuring the radius of a circle be 0.01%, find the corresponding error in calculating the area.

A. 0.0005

B. 2.5E-5

C. 0.0025

D. 0.001

Answer: D

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41. Find ten equation of the plane passing through the point $(0, 7, -7)$ and containing the line $\frac{x+1}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$.

A. x+y+z=1

B. x+y+z=2

C. x+y+z=0

D. None of these

Answer: C

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42. If $\cos^{-1}p+\cos^{-1}q+\cos^{-1}r=3\pi$, then $p^2+q^2+r^2+2pqr$ is equal to

A. 3

B. 1

C. 2

D. -1

Answer: B

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43. If $\frac{dy}{dx}+y=2e^{2x}$, then y is equal to

A. $ce^{x}+\frac{2}{3}e^{2x}$

B. $(1+x)e^{-x}+\frac{2}{3}e^{2x}+c$

C. $ce^{-x}+\frac{2}{3}e^{2x}$

D. $e^{-2x} + \frac{2}{3}e^{2x} + c$

Answer: C

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44. A random variable X can attain only the value 1,2,3,4,5 with respective probabilities k,2k,3k,2k,k. if m is the mean of the probability distribution, then (k,m) is equal to

A. $\left(3, \frac{1}{9}\right)$

B. $\left(\frac{1}{9}, 3\right)$

C. $\left(\frac{1}{8}, 4\right)$

D. $(1, 3)$

Answer: B

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45. If $y=\sqrt{\frac{1-x}{1+x}}$, then $(1-x^2)\frac{dy}{dx}+y$ is equal to

A. 1

B. -1

C. 2

D. 0

Answer: D

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46. A bag contains 3 white, 3 black and 2 red balls. One by one, three balls are drawn without replacing them. Find the probability that the third ball is red.

A. $\frac{2}{56}$

B. $\frac{3}{56}$

C. $\frac{1}{56}$

D. $\frac{14}{56}$

Answer: D

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47. If $A = adj$A, then |A| is equal to (A is invertible)

A. 1

B. 0

C. $\left|A^{-1}\right|$

D. None of these

Answer: A

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48. $\int_{8}^{15} \frac{dx}{(x-3)\sqrt{x+1}}$ is equal to

A. $\frac{1}{2}\log\frac{5}{3}$

B. $\frac{1}{3}\log\frac{5}{3}$

C. $\frac{1}{5}\log\frac{3}{5}$

D. $\frac{1}{2}\log\frac{3}{5}$

Answer: A

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49. If the straight lines $\frac{x-1}{k}=\frac{y-2}{2}=\frac{z-3}{3}$ and $\frac{x-2}{3}=\frac{y-3}{k}=\frac{z-1}{2}$ intersect at a point, then the integer k is equal to (1) -5 (2) 5 (3) 2 (4) -2

A. -2

B. -5

C. 5

D. 2

Answer: B

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50. The diection cosines of two lines are proportional to $(2, 3, -6)$ and $(3, -4, 5)$, then the acute angle between them is (A) $\cos^{-1}\left\{\frac{49}{36}\right\}$ (B) $\cos^{-1}\left\{\frac{18\sqrt{2}}{35}\right\}$ (C) 96^0 (D) $\cos^{-1}\left(\frac{18}{35}\right)$

A. $\cos^{-1}\left(\frac{49}{36}\right)$

B. $\cos^{-1}\left(\frac{18\sqrt{2}}{35}\right)$

C. 96°

D. $\cos^{-1}\left(\frac{18}{35}\right)$

Answer: B

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