MATHS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

PRACTICE SET 04

Paper 2 Mathmatics

1. If $A = \{4^n - 3n - 1 : n \in N)$ and $B = \{9(n-1) : n \in N\}$ then

A. $B \subset A$

B. $A \cup B = N$

C. $A \subset B$

D. None of these

Answer: C

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2. $x^2 = xy$ is a relation which is

A. symmetric

B. reflexive and transitive

C. transitive

D. none of these

Answer: B

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3. The range of the fuction $f(x) = x^2 + 2x + 2$ is

A. $(1, \infty)$

B. $(2, \infty)$

C. $(0, \infty)$

D. $[1, \infty)$

Answer: D

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4. The sum of 0.2+0.22+0.222+. . . . To n terms is equal to

A. $\left(\frac{2}{9}\right) - \left(\frac{2}{81}\right)\left(1 - 10^{-n}\right)$

B. $n - \left(\frac{1}{9}\right)\left(1 - 10^{-n}\right)$

C. $\left(\frac{2}{9}\right)\left[n - \left(\frac{1}{9}\right)\left(1 - 10^{-n}\right)\right]$

D. $\left(\frac{2}{9}\right)$

Answer: C

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5. Circle(s) touching x-axis at a distance 3 from the origin and having an intercept of length $2\sqrt{7}$ on y-axis is (are)

A. $x^2 + y^2 - 6x + 8y + 9 = 0$

B. $x^2 + y^2 - 6x + 7y + 9 = 0$

C. $x^2 + y^2 - 6x - 8y - 9 = 0$

D. $x^2 + y^2 - 6x - 7y + 9 = 0$

Answer: A

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6. If $A = \begin{bmatrix} \cos x & \sin x \\ \sin x & -\cos x \end{bmatrix}$ and $A(\text{adj } A) = \lambda \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then λ is equal to

A. $\sin x \cos x$

B. -1

C. -2

D. none of these

Answer: B

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7. $\int_0^{\pi/2} \frac{\cos x}{(1+\sin x)(2+\sin x)} dx$ is equal to

A. $\log \frac{4}{3}$

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

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

D. None of these

Answer: A

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8. If

$f(y) = e^y, g(y) = y, y > 0, \text{ and } F(t) = \int_0^t f(t-y)g(y)dy$

, then

A. $F(t) = 1 - e^{-t}(1+t)$

B. $F(t) = e^t - (1+t)$

C. $F(t) = te^t$

D. $F(t) = te^{-t}$

Answer: B

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9. The solution of the differential equation $\frac{dy}{dx} = (4x + y + 1)^2$, is

A. $(4x + y + 1) = \tan(2x + c)$

B. $(4 + y + 1)^2 = 2\tan(2x + c)$

C. $(4x + y + 1)^3 = 3\tan(2x + c)$

D. $(4x + y + 1) = 2\tan(2x + c)$

Answer: D

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10. If $x \sin\left(\frac{y}{x}\right) dy = \left[y \sin\left(\frac{y}{x}\right) - x\right] dx$ and $y(1) = \frac{\pi}{2}$, then the value of $\cos\left(\frac{y}{x}\right)$ is equal to

A. x

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

C. $\log x$

D. e^x

Answer: C

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11. Find the differential equation of system of cocentric circles with centre (1,2)

A. $(x-2)+(y-1)\frac{dy}{dx}=0$

B. $(x-1)+(y-2)+(y-2)\frac{dy}{dx}=0$

C. $(x+1)\frac{dy}{dx}+(y-2)=0$

D. $(x+2)\frac{dy}{dx}+(y-1)=0$

Answer: B

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12. If $\tan\left(\frac{\alpha\pi}{4}\right)=\cot\left(\frac{\beta\pi}{4}\right)$, then

A. $\alpha+\beta=0$

B. $\alpha+\beta=2n$

C. $\alpha+\beta=2n+1$

D. $\alpha+\beta=2(2n+1)$, $\forall$ n is an integer

Answer: D

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13. Angles A, B, C of a δABC are in AP and $b: c = \sqrt{3}: \sqrt{2}$, then $\angle A$ is given by

A. 75°

B. 45°

C. 60°

D. None of these

Answer: A

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14. IF α, β are the roots of the equation $6x^2 - 5x + 1 = 0$, then the value of $\tan^{-1}\alpha + \tan^2\beta$ is

A. 0

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

C. 1

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

Answer: B

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15. If one of the lines of $my^2 + \left(1 - m^2\right)xy - mx^2 = 0$ is a bisector of the angle between the lines $xy = 0$, then m

is 1 (b) 2 (c) $-\frac{1}{2}$ (d) -1

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

B. -2

C. ± 1

D. 2

Answer: C

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16. $\int \sqrt{1-\cos x}dx = ?$

A. $2\sqrt{2}\cos\frac{x}{2}+c$

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

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

D. None of these

Answer: B

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17. Find the area bounded by the y-axis, $y = \cos x, and y = \sin x when 0 \leq x \leq \frac{\pi}{2}$.

A. $(\sqrt{2}-1)$

B. $2(\sqrt{2}-1)$

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

D. None of these

Answer: A

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18. The derivative of $\sin x^3$ w.r.t. $\cos x^3$ is

A. $-\tan x^3$

B. $\tan x^3$

C. $-\cot x^3$

D. $\cot x^3$

Answer: C

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19. If $f(x) = |x|^3$, then $f'(0)$ equals

A. 0

B. 43832

C. -1

D. $-1/2$

Answer: A

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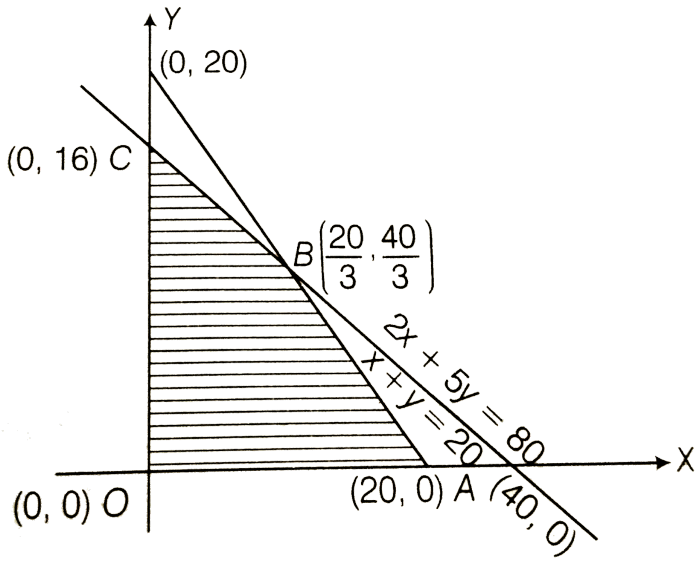
20. Shaded region is represented by



A. $2x + 5y \geq 80, x + y \leq 20, x \geq 0, y \leq$

B. $2x + 5y \geq 80, x + y \geq 20, x \geq 0, y \geq 0$

C. $2x + 5y \leq 80, x + y \leq 20, x \geq 0, y \geq 0$

D. $2x + 5y \leq 80, x + 2y \leq 20, x \leq 0, y \leq 0$

Answer: C

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21. If the normal to the curve $y = f(x)$ at the point $(3, 4)$ makes an angle $\frac{3\pi}{4}$ with the positive x-axis, then $f'(3) =$

(a) -1 (b) $-\frac{3}{4}$ (c) $\frac{4}{3}$ (d) 1

A. -1

B. $-\frac{3}{4}$

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

D. 1

Answer: D

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22. $\lim_{x \to \infty} \left(\frac{x+3}{x+1} \right)^{x+1}$ is equal to

A. e^2

B. e^3

C. e

D. e^{-1}

Answer: A

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23. The equation of the plane passing through (3,2,-1) and normal tot the line (2,1,2) and (4,3,-1) is

A. x+2y-3z=12

B. 2x-3y+z=11

C. 2x+2y-3z=13

D. 3x+2y-z=13

Answer: C

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24. For the Booleann function $f(x_1, x_2, x_3) = (x_1 \cdot x_2) + x_3,$ value of $f(1, 1, 0)$ is

A. 0

B. 1

C. -1

D. None of these

Answer: B

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25. The volume of the parallelopiped, if $a = 3\hat{i}, b = 5\hat{j}$ and $c = 4\hat{k}$ are coterminous edges of the parallelopiped is

A. 30 cu unit

B. 20 cu unit

C. 60 cu unit

D. none of these

Answer: C

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26. Find the ratio in which the line joining (2,4,5) and (3,5,4) is divided by the yz-plane.

A. $2:3$

B. $3:2$

C. $-2:3$

D. $4:-3$

Answer: C

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27. If ABCDEF is a regular hexagon then $\overrightarrow{AD} + \overrightarrow{EB} + \overrightarrow{FC}$ equals :

A. 0

B. 2AB

C. 3AB

D. 4AB

Answer: D

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28. The differential coefficient of f(sin x) with respect to x, where f(x)=log x, is

A. tan x

B. cot x

C. f (cos x)

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

Answer: B

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29. Gas is being pumped into a a spherical balloon at the rate of $30ft^3 / \min$. Then the rate at which the radius increases when it reaches the value 15 ft, is

A. $\frac{1}{30\pi} ft/\text{min}$

B. $\frac{1}{15\pi} ft/\text{min}$

C. $\frac{1}{20} ft/\text{min}$

D. $\frac{1}{25} ft/\text{min}$

Answer: A

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30. The vectors which is/are coplanar with vectors $\hat{i}+\hat{j}+2\hat{k}$ and $\hat{i}+2\hat{j}+\hat{k}$ and perpendicular to the vector $\hat{i}+\hat{j}+\hat{k}$ is /are (A) $\hat{j}-\hat{k}$ (B) $-\hat{i}+\hat{j}$ (C) $\hat{i}-\hat{j}$ (D) $-\hat{j}+\hat{k}$

A. $\left(\frac{\hat{j}-\hat{k}}{\sqrt{2}}\right)$

B. $\left(\frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}\right)$

C. $\left(\frac{\hat{i}+\hat{j}+2\hat{k}}{\sqrt{6}}\right)$

D. $\left(\frac{\hat{i}+2\hat{j}+\hat{k}}{\sqrt{6}}\right)$

Answer: A

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31. if the function $f: R \to R$ be defined by $f(x) = \tan x - x,$ then f(x) always

A. increases

B. decreases

C. remains constant

D. becomes zero

Answer: A

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32. $\int_0^{\pi} \frac{x dx}{1+\sin x}$ is equal to

A. $-\pi$

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

C. π

D. none of these

Answer: C

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33. If $f(x) = x + \frac{1}{x}, \quad x > 0$, then its greatest value is -2 (b) 0 (c) 3 (d) none of these

A. -2

B. 0

C. 3

D. none of these

Answer: D

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34. The sum to infinity of the series $1 + \frac{2}{3} + \frac{6}{3^2} + \frac{10}{3^3} + \frac{14}{3^4} \ldots\ldots$ is (1) 2 (2) 3 (3) 4 (4) 6

A. 3

B. 4

C. 6

D. 2

Answer: A

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35. A straight line passes through the points $(5, 0)$ and $(0, 3)$. The length of perpendicular from the point $(4, 4)$ on the line is

A. $\frac{15}{\sqrt{34}}$

B. $\frac{\sqrt{17}}{2}$

C. $\frac{17}{2}$

D. $\sqrt{\frac{17}{2}}$

Answer: D

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36. The ratio by which the line 2x + 5y -7=0 divides the straight line joining the points (-4,7) and (6,-5) is

A. $1:4$

B. $1:2$

C. $1:1$

D. $2:3$

Answer: C

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37. Let A (2,-3) and B(-2,1) be vertices of a triangle ABC. If the centroid of this triangle moves on line $2x + 3y = 1$, then the locus of the vertex C is the line :

A. $3x-2y=3$

B. $2x+3y=9$

C. $2x-3y=7$

D. $3x+2y=5$

Answer: B

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38. A hyperbola passes through a focus of the ellipse $\frac{x^2}{169}+\frac{y^2}{25}=1$. Its transverse and conjugate axes coincide respectively with the major and minor axes of the ellipse.The product of eccentricities is 1. Then the equation of the hyperbola is

A. $\frac{x^2}{144}+\frac{y^2}{9}=1$

B. $\frac{x^2}{169}-\frac{y^2}{25}=1$

C. $\frac{x^2}{144}-\frac{y^2}{25}=1$

D. $\frac{x^2}{25}-\frac{y^2}{9}=1$

Answer: C

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39. If $A = \begin{bmatrix} 1 & -2 & 1 \\ 2 & 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 3 & 2 \\ 1 & 1 \end{bmatrix}$ then (AB)' is equal to

A. $\begin{bmatrix} -3 & 10 \\ -2 & 7 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 2 \\ 7/2 & 2 \end{bmatrix}$

C. $\begin{bmatrix} 2 & 2 \\ 7/2 & 1 \end{bmatrix}$

D. None of these

Answer: A

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40. If equation $4x^2 + 2pxy + 25y^2 + 2x + 5y - 1 = 0$ represents parallel lines, then p is equal to

A. -10

B. 10

C. 5

D. -2

Answer: B

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41. A bag contains 5 brown and 4 white socks. A man pulls out two socks. The probability that these are of the same

colour is $\frac{5}{108}$ b. $\frac{18}{108}$ c. $\frac{31}{108}$ d. $\frac{48}{108}$

A. 5/108

B. 18/108

C. 30/108

D. 48/108

Answer: D

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42. The fucntion f(x)=x+cos x is

A. always increasing

B. always decreasing

C. increasing for certain range of x

D. none of these

Answer: A

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43. The logically equivalent proposition of $p \Leftrightarrow q$ is

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

B. $(p \Rightarrow) \wedge (q \Rightarrow p)$

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

D. $(p \wedge q) \Leftrightarrow (p \vee q)$.

Answer: B

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44. If $\vec{u}, \vec{v}, \vec{w}$ are noncoplanar vectors and p, q are real numbers, then the equality $\left[3\vec{u}, p\vec{v}, p\vec{w}\right] - \left[p\vec{v}, \vec{w}, q\vec{u}\right] - \left[2\vec{w}, q\vec{v}, q\vec{u}\right] = 0$ holds for (1) exactly one value of (p, q) (2) exactly two values of (p, q) (3) more than two but not all values of (p, q) (4) all values of (p, q)

A. exactly two values of (p,q)

B. more than two but not all value of (p,q)

C. all values of (p,q)

D. exactly one value of (p,q)

Answer: D

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45. $\int_{-1}^{0} \frac{dx}{x^2 + 2x + 2}$ is equal to

A. 0

B. $\pi/4$

C. $\pi/2$

D. $-\pi/4$

Answer: B

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46. A particle moves along the curve $y = x^2 + 2x$. At what point(s) on the curve are the x and y coordinates of the particle changing at the same rate?

A. $(1, 3)$

B. $\left(\frac{1}{2}, \frac{5}{2}\right)$

C. $\left(-\frac{1}{2}, -\frac{3}{4}\right)$

D. $(-1, -1)$

Answer: C

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47. If

$\alpha = x(a \times b) + y(b \times c) + z(c \times a)$ and $[abc] = \frac{1}{8}$,

then x+y+z is equal to

A. $8\alpha \cdot (a+b+c)$

B. $\alpha \cdot (a+b+c)$

C. $8(a+b+c)$

D. None of these

Answer: A

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48. The angle between the lines x=1, y=2 and y=-1, z=0 is

A. 30°

B. 60°

C. 90°

D. 0°

Answer: C

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49. If the range ot a random vaniabie X is $0, 1, 2, 3,$ at $P(X = K) = \left(\frac{K+1}{3^k}\right)$ a for $k \geq 0,$ then a equals

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

B. $\frac{4}{9}$

C. $\frac{8}{27}$

D. $\frac{16}{81}$

Answer: B

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50. An anti-aircraft gun can take a maximum of four shots at an enemy plane moving away from it. The probability of hitting the plane at the first, second, third and fourth shots are $0.4, 0.3, 0.2$ and 0.1, respectively, What is the probability that the plane is hit when all the four shots are fired? (A) 0.4379 (B) 0.6872 (C) 0.6976 (D) 0.3507

A. 0.6976

B. 0.3024

C. 0.72

D. 0.6431

Answer: A

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