MATHS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

MHTCET 2018

Mathematics

1. If $\int_0^k \frac{dx}{2+18x^2} = \frac{\pi}{24}$, then the value of k is

A. 3

B. 4

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

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

Answer: C

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2. The cartesian coordinates of the point on the parabola $y^2 = -16x$, whose parameter is $\frac{1}{2}$, are

A. $(-2, 4)$

B. $(4, -1)$

C. $(-1, -4)$

D. $(-1, 4)$

Answer: C

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3. $\int \frac{1}{\sin x \cdot \cos^2 x} dx =$

A. $\sec x + \log|\sec x + \tan x| + C$

B. $\sec x + \log|\sec x + \tan x| + C$

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

D. $\sec x + \log|\text{cosec}x - \cot x| + C$

Answer: D

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4. If $\log_{10}\left(\frac{x^3 - y^3}{x^3 + y^3}\right) = 2$, then $\frac{dy}{dx} =$

A. $\frac{x}{y}$

B. $-\frac{y}{x}$

C. $-\frac{x}{y}$

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

Answer: D

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5. If $f: R - \{2\} \to R$ is a function defined by $f(x) = \frac{x^2 - 4}{x - 2}$, then its range is

A. R

B. $R - \{2\}$

C. $R - \{4\}$

D. $R - \{-2, 2\}$

Answer: C

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6. If $f(x) = \begin{cases} x^2 + \alpha & \text{for } x \geq 0 \\ 2\sqrt{x^2 + 1} + \beta & \text{for } x < 0 \end{cases}$ is continuous at x=0 and $f\left(\frac{1}{2}\right) = 2$, then $\alpha^2 + \beta^2$ is

A. 3

B. $\frac{8}{25}$

C. $\frac{25}{8}$

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

Answer: C

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7. If $y = \left(\tan^{-1} x\right)^2$, then $\left(x^2+1\right)^2 \frac{d^2y}{dx^2} + 2x\left(x^2+1\right)\frac{dy}{dx} =$

A. 4

B. 2

C. 1

D. 0

Answer: A

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8. The line $5x + y - 1 = 0$ coincides with one of the lines given by $5x^2 + xy - kx - 2y + 2 = 0$, then the value of k is

A. -11

B. 31

C. 11

D. -31

Answer: C

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9. If $A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 1 & 2 \\ 1 & 2 & 4 \end{bmatrix}$, then $\left(A^2 - 5A\right)A^{-1} =$

A. $\begin{bmatrix} 4 & 2 & 3 \\ -1 & 4 & 2 \\ 1 & 2 & 1 \end{bmatrix}$

B. $\begin{bmatrix} -4 & 2 & 3 \\ -1 & -4 & 2 \\ 1 & 2 & -1 \end{bmatrix}$

C. $\begin{bmatrix} -4 & -1 & 1 \\ 2 & -4 & 2 \\ 3 & 2 & -1 \end{bmatrix}$

D. $\begin{bmatrix} -1 & -2 & 1 \\ 4 & -2 & -3 \\ 1 & 4 & -2 \end{bmatrix}$

Answer: B

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10. The equation of line passing through $(3, -1, 2)$ and perpendicular to the lines $\vec{r} = \left(\hat{i} + \hat{j} - \hat{k}\right) + \lambda\left(2\hat{i} - 2\hat{j} + \hat{k}\right)$ and $\vec{r} = \left(2\hat{i} + \hat{j} - 3\hat{k}\right) + \mu\left(\hat{i} - 2\hat{j} + 2\hat{k}\right)$ is

A. $\frac{x+3}{2} = \frac{y+1}{3} = \frac{z-2}{2}$

B. $\frac{x-3}{3} = \frac{y+1}{2} = \frac{z-2}{2}$

C. $\frac{x-3}{2} = \frac{y+1}{3} = \frac{z-2}{2}$

D. $\frac{x-2}{2} = \frac{y+1}{2} = \frac{z-2}{3}$

Answer: C

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11. Letters in the word HULULULU are rearranged. The probability of all three L being together is

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

B. $\frac{2}{5}$

C. $\frac{3}{28}$

D. $\frac{5}{23}$

Answer: C

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12. The sum of the first 10 terms of the series 9+99+999+ . . . Is

A. $\frac{9}{8}\left(9^{10}-1\right)$

B. $\frac{100}{9}\left(10^{9}-1\right)$

C. $10^9 - 1$

D. $\frac{100}{9}(10^{10} - 1)$

Answer: B

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13. If A,B,C are the angles off ΔABC, then $\cot A \cdot \cot B + \cot B \cdot \cot C + \cot C \cdot \cot A$=

A. 0

B. 1

C. 2

D. -1

Answer: B

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14. if $\int \frac{dx}{\sqrt{16-9x^2}} = A\sin^{-1}(Bx) + C$, then A+B=

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

B. $\frac{19}{4}$

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

D. $\frac{13}{12}$

Answer: D

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15. Evaluate: $\int e^x \left(\frac{2+\sin 2x}{1+\cos 2x}\right) dx$

A. $e^x \tan x + C$

B. $e^x + \tan x + C$

C. $2e^x \tan + C$

D. $e^x \tan 2x + C$

Answer: A

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16. A coin is tossed three times. If X denotes the absolute difference between the number of heads and the number of tails, then P(X=1)=

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

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

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

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

Answer: D

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17. If $2\sin\left(\theta+\frac{\pi}{3}\right)=\cos\left(\theta-\frac{\pi}{6}\right)$, then $\tan\theta$=

A. $\sqrt{3}$

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

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

D. $-\sqrt{3}$

Answer: D

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18. The area of the region bounded by $x^2 = 4y, y = 1, y = 4$ and the Y-axis lying in the first quadrant is ..... Square units.

A. $\frac{22}{3}$

B. $\frac{28}{3}$

C. 30

D. $\frac{27}{4}$

Answer: B

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19. if $f(x) = \frac{e^{x^2} - \cos x}{x^2}$, for $x \neq 0$ is continuous at $x = 0$, then value of f(0) is

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

B. $\frac{5}{2}$

C. 1

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

Answer: D

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20. The maximum value of $2x + y$ subject to

$3x + 5y \leq 26$ and $5x + 3y \leq 30, x \geq 0, y \geq 0$ is

A. 12

B. 11.5

C. 10

D. 17.33

Answer: A

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21. If $\vec{a}, \vec{b}, \vec{c}$ are mutually perpendicular vectors having magnitudes 1,2,3 respectively, then $\left[\vec{a}+\vec{b}+\vec{c} \quad \vec{b}-\vec{a} \vec{c}\right]=$

A. 0

B. 6

C. 12

D. 18

Answer: C

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22. If points $P(4, 5, x), Q(3, y, 4)$ and $R(5, 8, 0)$ are collinear, then the value of x+y is

A. -4

B. 3

C. 5

D. 4

Answer: D

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23. If the slope of one of the lines given by $ax^2 + 2hxy + by^2 = 0$ is two times the other, then

A. $8h^2 - 9ab$

B. $8h^2 = 9ab^2$

C. $8h = 9ab$

D. $8h = 9ab^2$

Answer: A

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24. The equation of the line passing through the point (-3,1) and bisecting the angle between coordinate axes is

A. $x + y + 2 = 0$

B. $-x + y + 2 = 0$

C. $x - y + 4 = 0$

D. $2x + y + 5 = 0$

Answer: A

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25. The negation of the statement: "Getting above $95\,\%$ marks is necessary condition for Hema to get the admission in good college".

A. Hema gets above $95\,\%$ marks but she does not get the admission in good college

B. Hema does not get above $95\,\%$ marks and she gets admission in good college

C. If Hema does not get above $95\,\%$ marks then she will not get the admission in good college

D. Hema does not get above $95\,\%$ marks or she gets the admission in good college

Answer: B

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26. $\cos 1^\circ . \cos 2^\circ . \cos 3^\circ \ldots\ldots\ldots \cos 179^\circ$ is equal to :

A. 0

B. 1

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

D. -1

Answer: A

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27. If the planes $x - cy - bz = 0, cx = y + az = 0 and bx + ay - z = 0$ pass through a straight line, then find the value of $a^2 + b^2 + c^2 + 2ab \cdot$

A. $1 - abc$

B. $abc - 1$

C. $1 - 2abc$

D. $2abc - 1$

Answer: C

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28. The lines represented by the equation $x^2 - y^2 - x + 3y - 2 = 0$ are

A. (1,0)

B. (0,2)

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

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

Answer: C

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29. A die is rolled. If X denotes the number of positive divisors of the outcome o the outcome, then the range of the random variable X is

A. {1,2,3}

B. {1,2,3,4}

C. {1,2,3,4,5,6}

D. {1,3,5}

Answer: C

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30. A die is thrown four times. The probality of getting perfect square in at least one throw is

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

B. $\frac{65}{81}$

C. $\frac{23}{81}$

D. $\frac{58}{81}$

Answer: B

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31. Evaluate the following :

$$\int_0^{\pi/4} x \sec^2 x dx$$

A. $\frac{\pi}{4} + \log\sqrt{2}$

B. $\frac{\pi}{4} - \log\sqrt{2}$

C. $1 + \log\sqrt{2}$

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

Answer: B

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32. In ΔABC, with usual notations, if a,b,c are in AP then $a\cos^2\left(\frac{C}{2}\right) + \cos^2\left(\frac{A}{2}\right) =$

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

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

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

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

Answer: C

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33. If $x = e^{\theta}(\sin\theta - \cos\theta), y = e^{\theta}(\sin\theta + \cos\theta)$, then $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$ is

A. 1

B. 0

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

D. $\sqrt{2}$

Answer: A

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34. The number of solution of $\sin x + \sin 3x + \sin 5x = 0$ in the interval $\left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$ is

A. 2

B. 3

C. 4

D. 5

Answer: B

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35. If $\tan^{-1}(2x) + \tan^{-1}(3x) = \frac{\pi}{4}$, then find the value of x.

A. -1

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

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

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

Answer: C

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36. Matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 5 \\ 2 & 4 & 7 \end{bmatrix}$, then the value of $a_{31}A_{31} + a_{32}A_{32} + a_{33}A_{33}$ is

A. 1

B. 13

C. -1

D. -13

Answer: C

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37. The contrapositive of the statement: "If the weather is fine then my friends will come and we go for a picnic".

A. The weather is fine but my friends will not come or we do not go for a picnic

B. If my friends do not come or we do not go for picnic then weather will not be fine

C. If the weather is not fine my friends will not come or we do not go for a pinic

D. The weather is not fine but my friends will come and we go for a picnic

Answer: B

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38. If $f(x) = \frac{x}{x^2+1}$ is increasing function, then the value of x lies in

A. R

B. $(-\infty, -1)$

C. $(1, \infty)$

D. $(-1, 1)$

Answer: D

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39. If

$X = \{4^n - 3n - 1, n \in N\}$ and $Y = \{9(n-1) : n \in N\}$, then $X \cap Y =$

A. X

B. Y

C. ϕ

D. $\{0\}$

Answer: A

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40. The statement pattern $p \wedge (\sim p \wedge q)$is

A. a tautology

B. a contradiction

C. equivalent to $p \wedge q$

D. equivalent to $p \vee q$

Answer: B

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41. If the line $y = 4x - 5$ touches the curve $y^2 = -ax^3 + b$ at the point (2, 3), show that $7a + 2b = 0$.

A. 0

B. 1

C. -1

D. 2

Answer: A

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42. The sides of a rectangle are given by $x = \pm a$ and $y = \pm b$. The equation of the circle passing through the vertices of the rectangle is

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

B. $x^2 + y^2 = a^2 + b^2$

C. $x^2 + y^2 = a^2 - b^2$

D. $(x - a)^2 + (y - b)^2 = a^2 + b^2$

Answer: B

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43. The minimum value of the function $f(x) = x \log x$ is

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

B. $-e$

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

D. e

Answer: A

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44. If $X \sim B(n, p)$ with $n = 10, p = 0.4$, then $E(X^2) =$

A. 4

B. 2.4

C. 3.6

D. 18.4

Answer: D

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45. Find the general solution of the differential equation $\frac{dy}{dx} = \frac{y}{x} + \cos. \frac{y}{x}$.

A. $\tan\left(\frac{x+y}{2}\right) = y + C$

B. $\tan\left(\frac{x+y}{2}\right) = x + C$

C. $\cot\left(\frac{x+y}{2}\right) = y + C$

D. $\cot\left(\frac{x+y}{2}\right) = x + C$

Answer: A

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46. IF planes $\vec{r} \cdot \left(p\hat{i} - \hat{j} + 2\hat{k}\right) + 3 = 0$ and $\vec{r} \cdot \left(2\hat{i} - p\hat{j} - \hat{k}\right) - 5 = 0$ include

angle $\frac{\pi}{3}$, then the value of p is

A. $1, \ -3$

B. $-1, 3$

C. -3

D. 3

Answer: D

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47. The order of the differential equation of all parabolas, whose latus rectu, is 4a and axis parallel to the X-axis, is

A. one

B. four

C. three

D. two

Answer: D

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48. If the lines $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4} and \frac{x-3}{1}=\frac{y-k}{2}=\frac{z}{1}$ intersect, then find the value of k.

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

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

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

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

Answer: A

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49. If a line makes angle 120° and 60° with the positive directions of X and Z-axes respectively, then the angle made by theline with positive Y-

axis is

A. 150°

B. 60°

C. 135°

D. 120°

Answer: C

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50. L and M are two points with position vectors $2\vec{a} - \vec{b}$ and $\vec{a} + 2\vec{b}$, respectively. The position vector of the pont N which divides the line segment LM in the ratio 2:1 externally is

A. $3\vec{b}$

B. $4\vec{b}$

C. $5\vec{b}$

D. $3\vec{a} + 4\vec{b}$

Answer: C

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