MATHS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

MHTCET 2010

Mathematics

1. If $\int_0^1 \tan^{-1} x \ dx = p$, then the value of $\int_0^1 \tan^{-1}\left(\frac{1-x}{1+x}\right) dx$ is

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

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

C. $1 + p$

D. $1 - p$

Answer: B

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2. If f(x) = x , g (x) = sinx , then $\int$ f(g(x)) dx is equal to

A. sinx + c

B. $-\cos x + c$

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

D. $x \sin x + c$

Answer: B

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3. The value of $\lim_{x \to 0} \frac{15^x - 5^x - 3^x + 1}{1 - \cos 2x}$ is

A. $\frac{(\log 3)(\log 5)}{2}$

B. 2 (log 3) (log 5)

C. $\frac{\log 3 + \log 5}{2}$

D. None of these

Answer: A

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4. The value of $\int_0^{\pi/2} \log(\sin x)\, dx$ is

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

B. $\pi \log 2$

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

D. $2\pi \log 2$

Answer: A

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5. If $x^2y^5 = (x+y)^7$, then $\frac{d^2y}{dx^2}$ is equal to

A. y/x^2

B. x/y

C. 1

D. 0

Answer: D

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6. The equation of tangent to the curve given by $x = 3\cos\theta, y = 3\sin\theta, at\theta = \frac{\pi}{4}$ is

A. $x + y = \sqrt{2}$

B. $3x + y = 3\sqrt{2}$

C. $x + y = 3\sqrt{2}$

D. $x + 3y = 3\sqrt{2}$

Answer: C

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7. If $\vec{a}, \vec{b}, \vec{c}$ are three non- coplanar vectors and $\vec{p}, \vec{q}, \vec{r}$ are vectors defined by the relations $\vec{p} = \frac{\vec{b} \times \vec{c}}{\left[\vec{a}\ \vec{b}\ \vec{c}\right]}, \vec{q} = \frac{\vec{c} \times \vec{a}}{\left[\vec{a}\ \vec{b}\ \vec{c}\right]}, \vec{r} = \frac{\vec{a} \times \vec{b}}{\left[\vec{a}\ \vec{b}\ \vec{c}\right]}$, then the value of expression $\left(\vec{a} + \vec{b}\right).\vec{p} + \left(\vec{b} + \vec{c}\right).\vec{q} + \left(\vec{c} + \vec{a}\right).\vec{r}$ is equal to

A. 0

B. 1

C. 2

D. 3

Answer: B

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8. The volume of a parallelopiped whose coterminous edges are $2\vec{a}, 2\vec{b}, 2\vec{c}$, is

A. $2\left[\vec{a}\ \vec{b}\ \vec{c}\right]$

B. $4\left[\vec{a}\ \vec{b}\ \vec{c}\right]$

C. $8\left[\vec{a}\ \vec{b}\ \vec{c}\right]$

D. $\left[\vec{a}\ \vec{b}\ \vec{c}\right]$

Answer: C

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9. If $x \sec\theta, y = \tan\theta$, then the value of $\frac{d^2y}{dx^2}$ at $\theta = \frac{\pi}{4}$ is

A. 0

B. 1

C. -1

D. 2

Answer: C

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10. If $x = f(t)$ and $y = g(t)$, then write the value of $\frac{d^2y}{dx^2}$.

A. $\frac{f'(t)g''(t) - g'(t)f''(t)}{\{f'(t)\}^3}$

B. $\frac{f'(t)g''(t) - g'(t)f''(t)}{\{f'(t)\}^2}$

C. $\frac{g'(t)f''(t) - g''(t)f'(t)}{\{f'(t)\}^2}$

D. $\frac{g'(t)f''(t) - g''(t)f'(t)}{\{f'(t)\}^3}$

Answer: A

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11. The value of a and b such that the function

$$f(x) = \begin{cases} -2\sin x, & -\pi \leq x \leq -\frac{\pi}{2} \\ a\sin x + b, & -\frac{\pi}{2} < x < \frac{\pi}{2} \\ \cos x, & \frac{\pi}{2} \leq x \leq \pi \end{cases}$$ is

continuous in $[-\pi, \pi]$ are

A. $-1, 0$

B. $1, 0$

C. 1,1

D. $-1, 1$

Answer: D

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12. If the equation of the tangent to the curve $y^2 = ax^3 + b$ at point $(2, 3) is y = 4x - 5$, then find the values of $a and b$.

A. 3,-5

B. 6,-5

C. 6,15

D. 6,-15

Answer: D

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13. The volume of the solid formed by rotating the area enclosed between the curve $y^2 = 4x, x = 4$ and x = 5 about X-axis is (in cubic units)

A. 18π

B. 36π

C. 9π

D. 24π

Answer: A

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14. $\int e^{\tan x}\left(\sec^2 x + \sec^3 x \sin x\right) dx$ is equal to

A. $\sec x e^{\tan x} + c$

B. $\tan x e^{\tan x} + c$

C. $e^{\tan x} + \tan x + c$

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

Answer: B

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15. Differentiate $(\log x)^x$ with respect to $\log x$.

A. $(\log x)^x\left[\frac{1}{\log x}+\log(\log x)\right]$

B. $(\log x)^x\left[\log x+\frac{1}{\log(\log x)}\right]$

C. $x(\log x)^x\left[\frac{1}{\log x}+\log(\log x)\right]$

D. None of the above

Answer: C

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16. $\int\frac{1}{16x^2+9}dx$ is equal to

A. $\frac{1}{3}\tan^{-1}\left(\frac{4x}{3}\right)+c$

B. $\frac{1}{4}\tan^{-1}\left(\frac{4x}{3}\right)+c$

C. $\frac{1}{12}\tan^{-1}\left(\frac{4x}{3}\right)+c$

D. $\frac{1}{12}\tan^{-1}\left(\frac{3x}{4}\right)+c$

Answer: C

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17. Evaluate the following :

$$\int_4^7 \frac{(11-x)^3}{x^3+(11-x)^3}dx$$

A. 1

B. $1/2$

C. $3/2$

D. 0

Answer: C

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18. Find the differential equation of the family of circles whose centres lie on X-axis.

A. $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 + 1 = 0$

B. $y\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 - 1 = 0$

C. $y\frac{d^2y}{dx^2} - \left(\frac{dy}{dx}\right)^2 - 1 = 0$

D. $y\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 + 1 = 0$

Answer: D

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19. The solution of the differential equation $y(1+\log x)\frac{dx}{dy} - x\log x = 0$ is

A. y log x = y + c

B. x log x = yc

C. y (1 + log x) = c

D. logx - y = c

Answer: B

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20. The order of the differential equation whose solution is $ae^x + be^{2x} + ce^{3x} + d = 0$ is

A. 1

B. 2

C. 3

D. 4

Answer: D

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21. The equation of normal to the curve $x^2 + y^2 = r^2$ at $p(\theta)$ is

A. $x \sin\theta - y\cos\theta = 0$

B. $x \sin\theta + y\cos\theta = 0$

C. $x \cos\theta - y\sin\theta = 0$

D. $x \cos\theta + y\sin\theta = 0$

Answer: A

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22. The equation of common tangent to the circle $x^2 + y^2 = 2$ and the parabola $y^2 = 8x$ is x + y = k .

Then value of k is

A. 1

B. -1

C. 2

D. -2

Answer: D

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23. The equation of the curve whose vertex is (0,0) and length of latusrectum is $\frac{16}{3}$, is

A. $8x^2 + 3y^2 = 72$

B. $16y^2 = 3x$

C. $3y^2 = 16x$

D. $3x^2 + 16y^2 = 48$

Answer: C

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24. The sum of focal radii of the curve $90x^2 + 25y^2 = 225$ is

A. 5

B. 10

C. 6

D. 3

Answer: B

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25. the equations of the tangents to $9x^2 + 16y^2 = 144,$ which make equal intercepts on the coordinate axes.

A. x + y = 5

B. x + y = 16

C. x + y = 15

D. None of these

Answer: A

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26. If e_1 and e_2 represent the eccentricity of the curves $6x^2 - 9y^2 = 144$ and $9x^2 - 16y^2 = 144$ respectively . Then $\frac{1}{e_1^2} + \frac{1}{e_2^2}$ is equal to

A. 0

B. 1

C. 2

D. 3

Answer: B

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27. If two dice are thrown together . Then , the probability that the sum of the numbers appearing on them is a prime number, is

A. $1/2$

B. $3/7$

C. $5/12$

D. $7/12$

Answer: C

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28. Let $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ -\sin\theta & -\cos\theta \end{bmatrix}$ then the inverse of a is

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

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

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

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

Answer: A

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29. The output of the following circuit is

A. p

B. q

C. $\sim p$

D. $p + q$

Answer: B

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30. The maximum value of Z = 3x + 2y for linear $x + y \leq 7, 2x + 3y \leq 16, x \geq 0, y \geq 0$ is the objective function constraints

A. 16

B. 21

C. 25

D. 28

Answer: B

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31. Dual of (x +y)$(x' \cdot 1)$ is

A. $(x \cdot y) + (x' + 1)$

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

C. $(x \cdot y) + (x + 1)$

D. None of these

Answer: A

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32. The value of f(4) - f(3) is

A. $\Delta f(2) + \Delta^2 f(1) + \Delta^3 f(1)$

B. $\Delta f(3) + \Delta^2 f(2) + \Delta^3 f(1)$

C. $\Delta f(2) + \Delta^2 f(1) + \Delta^3 f(0)$

D. None of the above

Answer: A

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33. $(1 + \Delta)^n$ f(a) is equal to

A. f(a + h)

B. f(a + 2h)

C. f(a + nh)

D. f(a + (n-1) h)

Answer: C

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34. Missing term in the following table is

x	: 0	1	2	3	4
$y = f(x)$	: 1	3	9	?	81

A. 27

B. 30

C. 31

D. 34

Answer: C

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35. If $u_0 = 8, u_1 = 3, u_2 = 12, u_3 = 51$, then the value of $\Delta^3 u_0$ is

A. 12

B. 14

C. 16

D. 18

Answer: C

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36. If p,q,r are single proposition with truth values T, F, F, then the truth value of $(p \wedge \sim q) \rightarrow (\sim p \vee r)$ is

A. T

B. F

C. Cannot find

D. None of these

Answer: B

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37. $(p \wedge q) \vee \sim p$ is equivalent to

A. $\sim p \wedge q$

B. $\sim p \vee q$

C. $p \wedge q$

D. $p \vee q$

Answer: B

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38. Simplify the Boolean function $(x \cdot y) + [(x + y') \cdot y]'$.

A. 0

B. 1

C. x + y

D. xy

Answer: B

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39. The value of $\lim_{x \to \infty} \frac{1+2+3...+n}{n^2}$ is

A. 1

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

C. 0

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

Answer: B

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40. If matrix $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then $|A|^{-1}$ is equal to

A. ad-bc

B. $\frac{1}{ad-bc}$

C. $\frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

D. None of these

Answer: B

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41. The position vectors of vertices of a ΔABC are

$4\hat{i}-2\hat{j}, \hat{i}+4\hat{j}-3\hat{k}$ and $-\hat{i}+5\hat{j}+\hat{k}$

respectively , then $\angle ABC$ is equal to

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

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

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

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

Answer: D

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42. A four digit number is to be formed using the digits 1,2,3, 4, 5,6,7 (no digit is being repeated in any number) . Then , the probability that it is > 4000 , is

A. $3/2$

B. $1/2$

C. $4/7$

D. $3/7$

Answer: C

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43. Two coins are tossed simultaneously. Then, the value of E(X), where X denotes the number of heads is

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

B. 2

C. 1

D. None of these

Answer: C

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44. The equation of the plane which passes through (2,-3,1) and is normal to the line joining the points (3,4,-1) and (2,-1,5) is given by

A. $x + 5y - 6z + 19 = 0$

B. $x - 5y + 6z - 19 = 0$

C. $x + 5y + 6z + 19 = 0$

D. $x - 5y - 6z - 19 = 0$

Answer: A

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45. If g is the inverse of f and f'(x) = $\frac{1}{1 + x^2}$, then g'(x) is equal to

A. $1 + [g(x)]^2$

B. $\frac{-1}{1+[g(x)]^2}$

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

D. None of these

Answer: A

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46. The angle between the lines in $x^2 - xy - 6y^2 - 7x + 31y - 18 = 0$ is

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

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

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

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

Answer: A

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47. The pair equation of the lines passing through the origin and having slopes 3 and $-\frac{1}{3}$, is

A. $3y^2 + 8xy - 3x^2 = 0$

B. $3x^2 + 8xy + 3y^2 = 0$

C. $3y^2 - 8xy - 3x^2 = 0$

D. $3x^2 + 8xy - 3y^2 = 0$

Answer: D

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48. Find the equations of the tangents to the circle $x^2 + y^2 - 6x + 4y = 12$ which are parallel to the straight line $4x + 3y + 5 = 0$

A. $3x - 4y - 19 = 0, 3x - 4y + 31 = 0$

B. $4x + 3y - 19 = 0, 4x + 3y + 31 = 0$

C. $4x + 3y + 19 = 0, 4x + 3y - 31 = 0$

D. $3x - 4y + 19 = 0, 3x - 4y + 31 = 0$

Answer: C

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49. Find the point where the line $\frac{x-1}{2} = \frac{y-2}{-3} = \frac{z+3}{4}$ meets the plane $2x + 4y - z = 1.$

A. (3,-1,1)

B. (3,1,1)

C. (1,1,3)

D. (1,3,1)

Answer: A

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50. Let the equation of circle is $x^2 + y^2 - 6x - 4y + 9 = 0$. Then the line 4x + 3y - 8 = 0 is a

A. tangent of the circle

B. normal of the circle

C. chord of the angle

D. None of the above

Answer: A