MATHS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

PRACTICE SET 01

Paper 2 Mathematics

1. If $y = x^{x^{x^{x^{\cdots}}}}$, then $\frac{dy}{dx}$ is equal to

A. yx^{y-1}

B. $\frac{y^2}{x(1-y\log x)}$

C. $\frac{y}{x(1+y\log x)}$

D. None of these

Answer: B

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2. If f(x) and g(x) are two functions with g (x) = $x - \frac{1}{x}$ and $fog(x) = x^3 - \frac{1}{x^3}$ then f(x) is

A. $3x^2 + 3$

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

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

D. $3x^2 + \frac{3}{x^4}$

Answer: A

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3. The value of f at x =0 so that funcation $f(x) = \frac{2^x - 2^{-x}}{x}, x \neq 0$ is continuous at x =0 is

A. 0

B. log 2

C. 4

D. log 4

Answer: D

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4. For the function $f(x) = \frac{e^{\frac{1}{x}} - 1}{e^{1/x} + 1}, x = 0$, which of the following is correct .

A. $\lim_{x \to 0} f(x)$ does not exist

B. $\lim_{x \to 0} f(x) = 1$

C. $\lim_{x \to 0} f(x)$ exist but f(x) is not continuous at x =0

D. f(x) is continuous at x =0

Answer: A

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5. The solution of the differential $x(x-y)\frac{dy}{dx} = y(x+y)$, is

A. $\frac{x}{y} + \log(xy) = c$

B. $\frac{y}{x} + (\log(xy) = 0$

C. $\frac{x}{y} + y\log x = c$

D. $\frac{x}{y} + x\log y = c$

Answer: A

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6. The general solution of

$y^2dx + (x^2 - xy + y^2)dy = 0$, is

A. $\tan^{-1}\left(\frac{y}{x}\right) = \log xy + c$

B. $2\tan^{-1}\left(\frac{x}{y}\right) + \log x + c = 0$

C. $\log y + \sqrt{x^2 + y^2} + \log y + c = 0$

D. $\sinh^{-1}\left(\frac{x}{y}\right) + \log y + c = 0$

Answer: A

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7. The degree of the differential equation $x = 1 + \left(\frac{dy}{dx}\right) + \frac{1}{2!}\left(\frac{dy}{dx}\right)^2 + \frac{1}{3!}\left(\frac{dy}{dx}\right)^3 + \ldots\ldots$

A. 3

B. 2

C. 1

D. not defined

Answer: C

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8. To open a lock, a key is taken out from a collection of n keys at random. If the lock is not opend with this key, it is put back into the collection and another key is tried. The process is repeated again and again. If it is given that with only one key

in the collection, the lock can be opend, then the probability that the lock will open in n trials, is

A. $\left(\frac{1}{n}\right)^n$

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

C. $1-\left(\frac{n-1}{n}\right)^n$

D. None of these

Answer: C

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9. Two dice are tossed once. Find the probability of getting an even number on the first die or a total of 8.

A. 1/36`

B. $\frac{3}{36}$

C. $\frac{11}{36}$

D. $\frac{5}{9}$

Answer: D

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10. The probability distribution of a random variable X is given as

Then, the value of p is

X	-5	-4	-3	-2	-1	0	1	2	3	4	5
$P(X)$	p	$2p$	$3p$	$4p$	$5p$	$7p$	$8p$	$9p$	$10p$	$11p$	$12p$

A. $\frac{1}{72}$

B. $\frac{3}{73}$

C. $\frac{5}{72}$

D. $\frac{1}{74}$

Answer: A

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11. The slopes of lines represented by $x^2 + 2hxy + 2y^2 = 0$ are in the ratio $1:2$, then h equals .

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

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

C. ± 1

D. ± 3

Answer: B

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12. The total number of subsets of a finite set A has 56 more elements than the total number of subsets of another finite set B. What is the number of elements in the set A?

A. 5

B. 6

C. 7

D. 8

Answer: B

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13. Let

$R = \{(3, 3), (6, 6), (9, 9), (12, 12), (6, 12), (3, 9(, (3, 12), (3, 6)\}$

be relation on the set $A = \{3, 6, 9, 12\}$. The relation is-

A. an equivalance relation

B. relflexive and symmetric

C. reflexive and transitive

D. only reflexive

Answer: C

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14. The domain of the function $f(x) = \sqrt{\cos x}$ is

A. $\left[\frac{3\pi}{2}, 2\pi\right]$

B. $\left[0, \frac{\pi}{2}\right]$

C. $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

D. $\left[0, \frac{\pi}{2}\right] \cup \left[\frac{3\pi}{2}, 2\pi\right]$

Answer: C

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15. If the sum of first 75 terms of an AP is 2625, then the 38th term of an AP is

A. 39

B. 37

C. 36

D. 35

Answer: D

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16. Consider an infinite geometric series with first term a and common ratio r. if the sum is 4 and the sencond term is 3/4 ,then

A. a=23 , $r = \frac{3}{8}$

B. $a = \frac{4}{7}, r = \frac{3}{7}$

C. $a = \frac{3}{2}, r = \frac{1}{2}$

D. $a = 3, r = \frac{1}{4}$

Answer: D

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17. A straight line perpendicular to the line 2x +y =3 is passing through (1,1) Its -intercept is

A. 1

B. 2

C. 3

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

Answer: D

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18. The solutions of the equation $4\cos^2 + 6\sin^2 x = 5$ are

A. $x = n\pi \pm \frac{\pi}{4}$

B. $x = n\pi \pm \frac{\pi}{3}$

C. $x = n\pi \pm \frac{\pi}{2}$

D. $x = n\pi \frac{2\pi}{3}$

Answer: A

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19. $\int_a^b \sqrt{(x-a)(b-x)}dx, (b > a)$ is equal to

A. $\frac{\pi(b-a)^2}{8}$

B. $\frac{\pi(b+a)^2}{8}$

C. $(b-a)^2$

D. $(b+a)^2$

Answer: A

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20. The valueof integral $\int_0^4 |x-1|dx$ is

A. 4

B. 5

C. 7

D. 9

Answer: B

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21. $\lim_{n \to \infty} \frac{1}{n} \sum_{r=1}^{2n} \frac{r}{\sqrt{n^2 + r^2}}$ equals

A. $1 + \sqrt{5}$

B. $-1 + \sqrt{5}$

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

D. $1 + \sqrt{2}$

Answer: B

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22. If in ΔABC, $a = 4, b = 3, A = 60^\circ$ then c is a root of the equation .

A. $c^2 - 3c - 7 = 0$

B. $c^2 - 3c + 7 = 0$

C. $c^2 - c + 7 = 0$

D. $c^2 + 3c - 7 = 0$

Answer: A

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23. If A = [a,b] , B = [- b, -a] and $C = \begin{bmatrix} a \\ -a \end{bmatrix}$ then the correct statement is

A. A = -A

B. A + B = A-B

C. AC = BC

D. CA = CB

Answer: A

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24. Let p and q be two statement s, then $(pvq)v\sim p$ is

A. tautology

B. contradiction

C. both (a) and (b)

D. none of the above

Answer: A

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25. If a + b + c = 0 and |a| = 1, |b| = 1, |c| = $\sqrt{3}$,then the angle between a and b is

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

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

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

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

Answer: B

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26. Which of the term is not used in a linear programming problem ?

A. slack variables

B. Objective function

C. Concave region

D. Feasible solution

Answer: C

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27. The function $f(x) = a\sin x + \frac{1}{3}\sin 3x$ has maximum value at $x = \frac{\pi}{3}$, the value of a is

A. 3

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

C. 2

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

Answer: C

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28. The equation of the normal to the curve $y = \sin x \cos x \quad \text{at} \quad x = \frac{\pi}{2}$, is

A. x=2

B. $x = \pi$

C. $x + \pi = 0$

D. $2x = \pi$

Answer: D

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29. The function x^x is increasing when

A. $x > \frac{1}{e}$

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

C. $x < 0$

D. $\forall \times \in R$

Answer: A

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30. $\int_0^{\pi/2} \frac{dx}{1+\sqrt[3]{\tan x}}$ is equal to

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

B. 0

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

D. None of these

Answer: C

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

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

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

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

D. 0

Answer: D

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32. Area bounded by the curves y = x ,y $= \tan x$ and $x = \frac{\pi}{4}$ is

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

B. $\left(\log\sqrt{2} = \frac{\pi^2}{32}\right)$ sq unit

C. $\left(\log 2 - \frac{\pi^2}{16}\right)$ sq unit

D. none of these

Answer: B

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33. The solution of differential edquation $\frac{dy}{dx} + 1 = \cos ec(x + y)$ is

A. $\cos(x+y)+x=c$

B. $\cos(x+y)=c$

C. $\sin(x+y)+x=c$

D. None of these

Answer: A

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34. If area bounded by the curve $y^2=4ax$ and $y=mx$ is $a^2/3$, then the value of m, is

A. 2

B. -2

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

D. None of these

Answer: A

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35. $\int \sin x \, d(\cos x)$ is equal to

A. $\frac{1}{4}\sin 2x + \frac{x}{2} + c$

B. $\frac{1}{4}\sin 2x - \frac{x}{2} + c$

C. $2\sin^2 x + c$

D. $\sin x + \cos x$

Answer: B

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36. $\lim_{x \to \infty} \left(\frac{x^2 + 5x + 3}{x^2 + x + 3} \right)^x$ is equal to

A. e^4

B. e^2

C. e^3

D. e

Answer: A

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37. If $f(x) = \begin{cases} \frac{\sqrt{1+kx} - \sqrt{1-kx}}{x} & \text{for } 1 \leq x < 0 \text{ and } 2x^2 + 3x - 2f \text{ or } 0 \leq x \leq 1 \text{ is continuous} \end{cases}$

at $x - 0$ then k

A. -4

B. -3

C. -2

D. -1

Answer: C

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38. 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: A

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39. The minimum value of linear objective function z =2x + 2y under linear constraints $3x + 2y \geq 12, x + 3y \geq 11$ and $x, y \geq 0$ is

A. 10

B. 12

C. 6

D. 5

Answer: A

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40. The angle between the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{4}$ and the plane 3 x + 2y -3z =4 is

A. 45°

B. 0°

C. $\cos^{-1}\left(\frac{24}{\sqrt{29}\sqrt{22}}\right)$

D. 90°

Answer: D

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41. Which of the following is not a proposition ?

A. $\sqrt{3}$ is a prime

B. $\sqrt{2}$ is irrational

C. Mathematics is interesting

D. 5 is an even integer

Answer: C

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42. A line AB in three-dimensional space makes angles $45o and 120o$ with the positive x-axis and the positive y-axis respectively. If AB makes an acute angle q with the positive z-axis, then q equals (1) $45o$ (2) $60o$ (3) $75o$ (4) $30o$

A. 30°

B. 45°

C. 60°

D. 75°

Answer: C

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43. The value of k such that $\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-k}{2}$ lies in the plane $2x - 4y = z = 7$ is a. 7 b. -7 c. no real value d. 4

A. 7

B. -7

C. no real value

D. 4

Answer: A

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44. if a = (2,1,-1) , b= (1,-1,0) , c = (5,-1,1) then unit vector parallel to a + b -c but opposite direction

A. $\frac{1}{3}\left(2\hat{i}-\hat{j}+2\hat{k}\right)$

B. $\frac{1}{2}\left(2\hat{i}-\hat{j}+2\hat{k}\right)$

C. $\frac{1}{3}\left(2\hat{i}-\hat{j}-2\hat{k}\right)$

D. none of these

Answer: A

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45. The function $f(x) = 2x^3 + 3x^2 - 12x + 1$ decreases in the interval

A. (2,3)

B. (1,2)

C. $(-2, 1)$

D. $(-3, -2)$

Answer: C

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46. A circle of radius $\sqrt{8}$ is passing through origin the point (4,0) . If the centre lies on the line y = x , then the equation of

the circle is

A. $(x-2)^2+(y-2)^2=8$

B. $(x+2)^2+(y+2)^2=8$

C. $(x-3)^2+(y-3)^2=8$

D. $(x+3)^2+(y+3)^2=8$

Answer: A

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47. The length (in units) of tangent from point $(5,1)$ to the circle $x^2+y^2+6x-4y-3=0$ is

A. 81

B. 29

C. 7

D. 21

Answer: C

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48. The curve $5x^2 + 12xy - 22x - 12y - 19 = 0$ is.

A. ellispe

B. parabola

C. hyperbola

D. parallel striaight lines

Answer: C

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49. The locus of the point of intersection of the tangents at the extremities of the chords of the ellipse $x^2 + 2y^2 = 6$ which touch the ellipse $x^2 + 4y^2 = 4,$ is $x^2 + y^2 = 4$ (b) $x^2 + y^2 = 6$ $x^2 + y^2 = 9$ (d) None of these

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

B. $x^2 + y^2 = 6$

C. $x^2 + y^2 = 9$

D. None of these

Answer: C

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50. The length of the straight line $x - 3y = 1$ intercepted by the hyperbola $x^2 - 4y^2 = 1$ is $\frac{6}{\sqrt{5}}$ b. $3\sqrt{\frac{2}{5}}$ c. $6\sqrt{\frac{2}{5}}$ d. none of these

A. $\frac{3}{5}\sqrt{10}$

B. $\frac{6}{5}\sqrt{10}$

C. $\frac{5}{3}\sqrt{10}$

D. $\frac{5}{6}\sqrt{10}$

Answer: B

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