Rao IIT Academy

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MH - CET : 2017

MATHEMATICS

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Mathematics

Single Correct Questions +2 | -0

1. The statement pattern $(\sim p \wedge q)$ is logically equivalent to

(A) $(\sim p \vee q) \vee \sim p$ (B) $(p \vee q) \wedge \sim p$ (C) $(p \wedge q) \to p$ (D) $(p \vee q) \to p$

2. If $g(x)$ is the inverse function of $f(x)$ and $f'(x) - \dfrac{1}{1+x^4}$ then $g'(x)$ is

(A) $1+[g(x)]^4$ (B) $1-[g(x)]^4$ (C) $1+[f(x)]^4$ (D) $\dfrac{1}{[g(x)]^4}$

3. The inverse of the matrix $\begin{bmatrix} 1 & 0 & 0 \\ 3 & 3 & 0 \\ 5 & 2 & -1 \end{bmatrix}$ is

(A) $-\dfrac{1}{3}\begin{bmatrix} -3 & 0 & 0 \\ 3 & 1 & 0 \\ 9 & 2 & -3 \end{bmatrix}$ (B) $-\dfrac{1}{3}\begin{bmatrix} -3 & 0 & 0 \\ 3 & -1 & 0 \\ -9 & -2 & 3 \end{bmatrix}$

(C) $-\dfrac{1}{3}\begin{bmatrix} 3 & 0 & 0 \\ 3 & -1 & 0 \\ -9 & -2 & 3 \end{bmatrix}$ (D) $-\dfrac{1}{3}\begin{bmatrix} -3 & 0 & 0 \\ -3 & 1 & 0 \\ -9 & -2 & 3 \end{bmatrix}$

4. If $\int \frac{1}{\sqrt{9-16x^2}}dx = \alpha \sin^{-1}(\beta x) + c$ then $\alpha + \dfrac{1}{\beta} =$

(A) 1 (B) $\dfrac{7}{12}$ (C) $\dfrac{19}{12}$ (D) $\dfrac{9}{12}$

5. $O(0,0), A(1,2), B(3,4)$ are the vertices of ΔOAB. The joint equation of the altitude and median drawn from O is

(A) $x^2+7xy-y^2=0$ (B) $x^2+7xy+y^2=0$

(C) $3x^2-xy-2y^2=0$ (D) $3x^2+xy-2y^2=0$

Space for rough use

6. If $\int \frac{1}{(x^2+4)(x^2+9)}dx = A\tan^{-1}\frac{x}{2} + B\tan^{-1}\left(\frac{x}{3}\right) + C$ then $A - B =$

(A) $\frac{1}{6}$ (B) $\frac{1}{30}$ (C) $-\frac{1}{30}$ (D) $-\frac{1}{6}$

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

(A) $\frac{\pi}{2}$ (B) 0 (C) π (D) $\frac{\pi}{4}$

8. If $x = a\left(t - \frac{1}{t}\right), y = a\left(t + \frac{1}{t}\right)$ where t be the parameter then $\frac{dy}{dx}$ =?

(A) $\frac{y}{x}$ (B) $\frac{-x}{y}$ (C) $\frac{x}{y}$ (D) $\frac{-y}{x}$

9. The point on the curve $y = \sqrt{x-1}$ where the tangent is perpendicular to the line $2x + y - 5 = 0$ is

(A) $(2, -1)$ (B) $(10, 3)$ (C) $(2, 1)$ (D) $(5, -2)$

10. If $\int \sqrt{\frac{x-5}{x-7}}dx = A\sqrt{x^2 - 12x + 35} + \log\left|x - 6 + \sqrt{x^2 - 12x + 35}\right| + C$ then $A =$

(A) -1 (B) $\frac{1}{2}$ (C) $-\frac{1}{2}$ (D) 1

11. The number of principal solutions of $\tan 2\theta = 1$ is

(A) One (B) Two (C) Three (D) Four

12. The objective function $z = 4x_1 + 5x_2$, subject to $2x_1 + x_2 \geq 7, 2x_1 + 3x_2 \leq 15$, $x_2 \leq 3, x_1, x_2 \geq 0$ has minimum value at the point.

(A) On x-axis
(B) On y-axis
(C) At the origin
(D) On the line parallel to x-axis

Space for rough use

13. If z_1 and z_2 are z co-ordinates of the points of trisection of the segment joining the points $A(2,1,4), B(-1,3,6)$ then $z_1 + z_2 =$

(A) 1 (B) 4 (C) 5 (D) 10

14. The maximum value of $f(x) = \dfrac{\log x}{x} (x \neq 0, x \neq 1)$ is

(A) e (B) $\dfrac{1}{e}$ (C) e^2 (D) $\dfrac{1}{e^2}$

15. $\displaystyle\int_0^1 x \tan^{-1} x dx =$

(A) $\dfrac{\pi}{4} + \dfrac{1}{2}$ (B) $\dfrac{\pi}{4} - \dfrac{1}{2}$ (C) $\dfrac{1}{2} - \dfrac{\pi}{4}$ (D) $-\dfrac{\pi}{4} - \dfrac{1}{2}$

16. If c denotes the contradiction then dual of the compound statement $\sim p \wedge (q \vee c)$ is

(A) $\sim p \vee (q \wedge t)$ (B) $\sim p \wedge (q \vee t)$ (C) $p \vee (\sim q \vee t)$ (D) $\sim p \vee (q \wedge c)$

17. The differential equation of all parabolas whose axis is y-axis is

(A) $x\dfrac{d^2y}{dx^2} - \dfrac{dy}{dx} = 0$ (B) $x\dfrac{d^2y}{dx^2} + \dfrac{dy}{dx} = 0$

(C) $\dfrac{d^2y}{dx^2} - y = 0$ (D) $\dfrac{d^2y}{dx^2} - \dfrac{dy}{dx} = 0$

18. $\int_0^3 [x] dx =$ ______________, where $[x]$ is greatest integer function.

(A) 3 (B) 0 (C) 2 (D) 1

19. The objective function of LPP defined over the convex set attains its optimum value at

(A) At least two of the corner points (B) All the corner points

(C) At least one of the corner points (D) None of the corner points

Space for rough use

20. If the inverse of the matrix $\begin{bmatrix} \alpha & 14 & -1 \\ 2 & 3 & 1 \\ 6 & 2 & 3 \end{bmatrix}$ does not exist then the value of α is

(A) 1 (B) -1 (C) 0 (D) -2

21. If the function $f(x) = \left[\tan\left(\frac{\pi}{4} + x\right)\right]^{1/x}$ for $x \neq 0$

$= K$ for $x = 0$

is continuous at $x = 0$ then $K = ?$

(A) e (B) e^{-1} (C) e^2 (D) e^{-2}

22. For a invertible matrix A if $A(adj\ A) = \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$ then $|A| =$

(A) 100 (B) -100 (C) 10 (D) -10

23. The solution of the differential equation $\frac{dy}{dx} = \tan\left(\frac{y}{x}\right) + \frac{y}{x}$ is

(A) $\cos\left(\frac{y}{x}\right) = cx$ (B) $\sin\left(\frac{y}{x}\right) = cx$

(C) $\cos\left(\frac{y}{x}\right) = cy$ (D) $\sin\left(\frac{y}{x}\right) = cy$

24. In ΔABC if $\sin^2 A + \sin^2 B = \sin^2 C$ and $l(AB) = 10$ then the maximum value of the area of ΔABC is

(A) 50 (B) $10\sqrt{2}$ (C) 25 (D) $25\sqrt{2}$

25. If $x - f(t)$ and $y = g(t)$ are differentiable functions of t then $\frac{d^2y}{dx^2}$ is

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

Space for rough use

26. A $r.v. X \sim B(n, p)$. If values of mean and variance of X are 18 and 12 respectively then total number of possible values of X are

(A) 54 (B) 55 (C) 12 (D) 18

27. The area of the region bounded by the lines $y = 2x + 1, y = 3x + 1$ and $x = 4$ is

(A) 16 sq. unit (B) $\frac{121}{3}$ sq. unit (C) $\frac{121}{6}$ sq. unit (D) 8 sq. unit

28. A box contains 6 pens, 2 of which are defective. Two pens are taken randomly from the box. If r.v. X: Number of defective pens obtained, then standard deviation of X =

(A) $\pm\frac{4}{3\sqrt{5}}$ (B) $\frac{8}{3}$ (C) $\frac{16}{45}$ (D) $\frac{5}{3\sqrt{5}}$

29. If the volume of spherical ball is increasing at the rate of 4π cc/sec then the rate of change of its surface area when the volume is 288π cc is

(A) $\frac{4}{3}\pi\ cm^2/$ sec (B) $\frac{2}{3}\pi\ cm^2/$ sec (C) $4\pi\ cm^2/$ sec (D) $2\pi\ cm^2/$ sec

30. If $f(x) = \log(\sec^2 x)^{\cot^2 x}$ for $x \neq 0$
$= K$ for $x = 0$ is continuous at x =0 then K is

(A) e^{-1} (B) 1 (C) e (D) 0

31. If the origin and the point P(2,3,4), Q(1,2,3) and R(x, y, z) are co-planar then

(A) $x - 2y - z = 0$ (B) $x + 2y + z = 0$
(C) $x - 2y + z = 0$ (D) $2x - 2y + z = 0$

32. If lines represented by equation $px^2 - qy^2 = 0$ are distinct then

(A) $pq > 0$ (B) $pq < 0$ (C) $pq = 0$ (D) $p + q = 0$

Space for rough use

33. Let $\square PQRS$ be a quadrilateral. If M and N are the midpoints of the sides PQ and RS respectively then $\overline{PS}+\overline{QR}=$

(A) $3\overline{MN}$ (B) $4\overline{MN}$ (C) $2\overline{MN}$ (D) $2\overline{NM}$

34. If slopes of lines represented by $Kx^2+5xy+y^2=0$ differ by 1 then $K=$

(A) 2 (B) 3 (C) 6 (D) 8

35. If vector $\bar{r}$ with d.c.s. l, m, n is equally inclined to the co-ordinate axes, then the total number of such vectors is

(A) 4 (B) 6 (C) 8 (D) 2

36. The particular solution of the differential equation $xdy+2ydx=0$, when $x=2, y=1$ is

(A) $xy=4$ (B) $x^2y=4$ (C) $xy^2=4$ (D) $x^2y^2=4$

37. ΔABC has vertices at $A=(2,3,5)$, $B=(-1,3,2)$ and $C=(\lambda,5,\mu)$. If the median through A is equally inclined to the axes, then the values of λ and μ respectively are

(A) 10, 7 (B) 9, 10 (C) 7, 9 (D) 7, 10

38. For the following distribution function F(x) of a.r.v. X

x	1	2	3	4	5	6
F(x)	0.2	0.37	0.48	0.62	0.85	1

$P(3<x\le 5)=$

(A) 0.48 (B) 0.37 (C) 0.27 (D) 1.47

39. The lines $\frac{x-1}{2}=\frac{y+1}{2}=\frac{z-1}{4}$ and $\frac{x-3}{1}=\frac{y-k}{1}=\frac{z}{1}$ intersect each other at point

(A) (-2, -4, 5) (B) (-2, -4, -5) (C) (2,4,-5) (D) (2, -4, -5)

Space for rough use

40. $\int \frac{\sec^8 x}{cosec\, x} dx =$

(A) $\frac{\sec^8 x}{8} + c$ (B) $\frac{\sec^7 x}{7} + c$ (C) $\frac{\sec^6 x}{6} + c$ (D) $\frac{\sec^9 x}{9} + c$

41. The equation of line equally inclined to co-ordinate axes and passing through (-3, 2,-5) is

(A) $\frac{x+3}{1} = \frac{y-2}{1} = \frac{z+5}{1}$ (B) $\frac{x+3}{1} = \frac{y-2}{1} = \frac{5+z}{1}$

(C) $\frac{x+3}{-1} = \frac{y-2}{1} = \frac{z+5}{1}$ (D) $\frac{x+3}{-1} = \frac{2-y}{1} = \frac{z+5}{-1}$

42. If $\int_0^{\frac{\pi}{2}} \log \cos x \, dx = \frac{\pi}{2} \log \left(\frac{1}{2}\right)$ then $\int_0^{\frac{\pi}{2}} \log \sec x \, dx =$

(A) $\frac{\pi}{2} \log \left(\frac{1}{2}\right)$ (B) $1 - \frac{\pi}{2} \log \left(\frac{1}{2}\right)$ (C) $1 + \frac{\pi}{2} \log \left(\frac{1}{2}\right)$ (D) $\frac{\pi}{2} \log 2$

43. A boy tosses fair coin 3 times. If he gets Rs. 2X for X heads then his expected gain equals to Rs. ....

(A) 1 (B) $\frac{3}{2}$ (C) 3 (D) 4

44. Which of the following statement pattern is a tautology ?

(A) $p \vee (q \to p)$ (B) $\sim q \to \sim p$

(C) $(q \to p) \vee (\sim p \leftrightarrow q)$ (D) $p \wedge \sim p$

45. If the angle between the planes $\bar{r}.(m\hat{i} - \hat{j} + 2\hat{k}) + 3 = 0$ and $\bar{r}.(2\hat{-}m\hat{j} - \hat{k}) - 5 = 0$ is $\frac{\pi}{3}$ then $m =$

(A) 2 (B) ± 3 (C) 3 (D) -2

Space for rough use

46. If $f(x) = x$ for $x \leq 0$
$= 0$ for $x > 0$
then $f(x)$ at $x = 0$ is

(A) Continuous but not differentiable
(B) Not continuous but differentiable
(C) Continuous and differentiable
(D) Not continuous and not differentiable

47. The equation of the plane through (-1, 1, 2), whose normal makes equal acute angles with co-ordinate axes is

(A) $\bar{r}.(\hat{i}+\hat{j}+\hat{k}) = 2$
(B) $\bar{r}.(\hat{i}+\hat{j}+\hat{k}) = 6$
(C) $\bar{r}.(3\hat{i}-3\hat{j}+3\hat{k}) = 2$
(D) $\bar{r}.(\hat{i}-\hat{j}+\hat{k}) = 3$

48. Probability that a person will develop immunity after vaccination is 0.8. If 8 people are given the vaccine then probability that all develop immunity is =

(A) $(0.2)^8$
(B) $(0.8)^8$
(C) 1
(D) ${}^8C_6(0.2)^6(0.8)^2$

49. If the distance of points $2\hat{i}+3\hat{j}+\lambda\hat{k}$ from the plane $\bar{r}(3\hat{i}+2\hat{j}+6\hat{k}) = 13$ is 5 units then $\lambda =$

(A) $6, -\dfrac{17}{3}$
(B) $6, \dfrac{17}{3}$
(C) $-6, -\dfrac{17}{3}$
(D) $-6, \dfrac{17}{3}$

50. The value of $\cos^1\left(\cot\left(\dfrac{\pi}{2}\right)\right)+\cos^{-1}\left(\sin\left(\dfrac{2\pi}{3}\right)\right)$ is

(A) $\dfrac{2\pi}{3}$
(B) $\dfrac{\pi}{3}$
(C) $\dfrac{\pi}{2}$
(D) π

Space for rough use