1. If the vertices of a triangle are A(0,4,1), B(2,3,-1) and C(4,5,0), then the orthocenter of ΔABC, is

(a) (4,5,0) (b) (2,3,1) (c) (-2,3,-1) (d) (2,0,2)

2. The equation of normal to the curve y = $(1+x)^y + \sin^{-1}(\sin^2 x)$ at x = 0 is

(a) x+y = 1 (b) x-y = 1

(c) x+y = -1 (d) x-y = -1

3. The value of c from the Lagrange's mean value theorem for which f(x) = $\sqrt{25 - x^2}$ in [1,5], is

(a) 5 (b) 1

(c) $\sqrt{15}$ (d) None of these

4. if A = $\begin{bmatrix} 3 & 4 \\ 5 & 7 \end{bmatrix}$, then A . (adj A) is ewqual to

(a) A (b) | A |

(c) A | . / (d) None of these

5. If there is an error of k% in measuring the edge of a cube, then per cent in estimating its volume is

(a) k (b) 3k (c) $\frac{k}{3}$ (d) None of these

6. If the system of equations x+ky-z = 0, 3x-ky-z = 0 and x-3y+z = 0, has non zero solution, then k is equal to

(a) -1 (b) 0 (c) 1 (d) 2

7. If the points (1,2,3) and (2,-1,0) lie on the opposite sides of the plane 2x+3y-2z = k, then

(a) k<1 (b) k>2

(c) k<1 or k>2 (d) 1<k<2

8. If Δ(x) = $\begin{vmatrix} 1 & \cos x & 1-\cos x \\ 1+\sin x & \cos x & 1+\sin x-\cos x \\ \sin x & \sin x & 1 \end{vmatrix}$, then $\int_0^{\pi/4} \Delta(x)dx$ is equal to

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$

(b) 0 (d) $-\frac{1}{4}$

9. Let f' (x), be differentiable ∀x. If f(1) = -2 and f'(x) ≥ 2 ∀ x ∈ [1,6], then

(a) f(6) < 8 (b) f(6) ≥8

(c) f(6) ≥ 5 (d) f(6) ≤ 5

10. If Δ_r = $\begin{vmatrix} 2r-1 & {}^{m}C_r & 1 \\ m^2-1 & 2^m & m+1 \\ \sin^2(m^2) & \sin^2 m & \sin^2(m+1) \end{vmatrix}$, then the value of $\sum_{r=0}^{m} \Delta_r$ is

(a) 1 (b) 0 (c) 2 (d) None of these

11. Two lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $\frac{x-3}{1} = \frac{y-k}{2} = z$ intersect at a point, if k is equal to

(a) $\frac{2}{9}$ (b) $\frac{1}{2}$

(c) $\frac{9}{2}$ (d) $\frac{1}{6}$

12. The minimum value of $\frac{x}{\log x}$ is

(a) e (b) $\frac{1}{e}$ (c) e^2 (d) e^3

13. The triangle formed by the tangent to the curve $f(x) = x^2 + bx - b$ at the poibt (1,1) and the coordinate axes lies in the first quadrant. If its area is 2, then the value of b is

(a) -1 (b) 3 (c) -3 (d) 1

14. The statement (p □q) ⟺ (~p Λq) is a

(a) tautology (b) contradiction

(c) Neither (a) nor (b) (d) None of these

15. If x+I y = $\frac{3}{2+\cos\theta+I\sin\theta}$ then x^2+y^2 is eq9ual to

(a) 3x-4 (b) 4x-3

(c) 4x+3 (d) None of these

16. The negation of $(\sim p \wedge q) \vee (p \wedge \sim q)$ is

(a) $(p \vee \sim q) \vee (\sim p \vee q)$

(b) $(p \vee \sim q) \wedge (\sim p \vee q)$

(c) $(p \wedge \sim q) \wedge (\sim p \vee q)$

(d) $(p \wedge \sim q) \wedge (p \vee \sim q)$

17. The normals at three points P,Q and R of the parabola $y^2 = 4ax$ meet at (h,k). The centroid of the ΔPQR lies on

(a) x = 0 (b) y = 0

(c) x = -a (d) y = a

18. The minimum area of the triangle formed by any tengent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ with the coordinate axes is

(a) a^2+b^2 (b) $\frac{(a+b)^2}{2}$

(c) ab (d) $\frac{(a-b)^2}{2}$

19. If the line lx+my-n = 0 will be a normal to the hyperbola, then $\frac{a^2}{l^2} - \frac{b^2}{m^2} = \frac{(a^2+b^2)^2}{k}$, where k is equal to

(a) n (b) n^2

(c) n^3 (d) None of these

20. If cos α + I sin α, b=cos β + I sin β, c = cos γ + I sin γ and $\frac{b}{c}+\frac{c}{a}+\frac{a}{b}$ = 1, then cos(β-γ) + cos(γ-α) + cos(α-β) is equal to

(a) $\frac{3}{2}$ (b) $-\frac{3}{2}$ (c) 0 (d) 1

21. If | z+4 | ≤ 3, then the greatest and the least value of |z+1| are

(a) -1,6 (b) 6,0

(c) 6,3 (d) None of these

22. The angle between lines joining the origin to the point of intersection of the line $\sqrt{3}x+y=2$ and the curve $y^2-x^2 = 4$

(a) $\tan^{-1}\frac{2}{\sqrt{3}}$ (b) π/6

(c) $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$ (d) π/2

23. If the area of the triangle on the complex plane formed by the points z,z+ iz and iz is 200, then the value of 3 | z | must be equal to

(a) 20 (b) 40 (c) 60 (d) 80

24. Equation of the chord of the hyperbola $25x^2-16y^2 = 400$ which is bisected at trhe point (6,2), is

(a) 6x – 7y = 418 (b) 75x – 16y = 418

(c) 25x – 4y = 400 (d) None of these

25. If a plane meets the coordinate axes at A,B and C such that the centroid of the triangle is (1,2,4), then the equation of the plane is

(a) x+2y+4z = 12 (b) 4x+2y+z = 12

(c) x+2y+4z = 3 (d) 4x+2y+z = 3

26. The volume of the tetrahedron included between the plane 3x+4y-5z-60 = 0 and the coordinate planes is

(a) 60 (b) 600 (c) 720 (d) 400

27. $\int_0^{2\pi}(\sin x + |\sin x|)\,dx$ is equal to

(a) 0 (b) 4 (c) 8 (d) 1

28. The value of $\int_0^{\sqrt{2}}[x^2]\,dx$, where [.] is the greatest integer function, is

(a) 2 - √2 (b) 2 + √2

(c) √2-1 (d) √2-2

29. If I(m,n) = $\int_0^1 t^m(1+t)^n\,dt$, then the expression for I(m,n) in terms of I(m+1,n+1) is

(a) $\frac{2^n}{m+1} - \frac{n}{m+1}$. I(m+1,n-1)

(b) $\frac{n}{m+1}$. I(m+1,n-1)

(c) $\frac{2n}{m+1} + \frac{n}{m+1}$. I(m+1,n-1)

(d) $\frac{m}{n+1}$. I(m+1,n-1)

30. The area in the first quadrant between $x^2+y^2 = \pi^2$ and y =sin x is

(a) $\frac{\pi^3-8}{4}$ (b) $\frac{\pi^3}{4}$

(c) $\frac{®^3-16}{4}$ (b) $\frac{®^3-8}{2}$

31. The area bounded by y = $xe^{|x|}$ and lines | x | = 1, y=0 is

(a) 4 sq units (b) 6 sq units

(c) 1 sq unit (d) 2 sq units

32. The solution of $\frac{dy}{dx} = \frac{x^2+y^2+1}{2xy}$, satisfying y(1) = 0 is given by

(a) hyperbola (b) circle

(c) ellipse (d) parabola

33. If $x.\frac{dy}{dx} + y = x.\frac{f(xy)}{f'(xy)}$, then f(xy) is equal to

(a) $k.e^{\frac{x^2}{2}}$ (b) $k.e^{y^2/2}$

(c) $k.e^{x^2}$ (d) $k.e^{\frac{xy}{2}}$

34. The differential equation of the rectangular hyperbola hyperbola, where axes are the asymptotes of the hyperbola, is

(a) $y\frac{dx}{dx} - x$ (b) $x\frac{dy}{dx} = -y$

(b) $x\frac{dy}{dx} = y$ (d) xdy + ydx =c

35. The length of longer diagonal of the parallelogram constructed on 5a+2b and a-3b, if it the given that |a| = $2\sqrt{2}$,|b| = 3 and the angle between a and b is $\frac{\pi}{4}$, is

(a) 15 (b) $\sqrt{113}$ (c) $\sqrt{593}$ (d) $\sqrt{369}$

36. If r=αb xc+βcxa+γaxxb and [a b c] = 2,

(a) r.[bxc+cxa+axb]

(b) $\frac{1}{2}$r.(a+b+c)

(c) 2r.(a+b+c)

(d) 4

37. If a,b,c are three non-coplanar vectors and p,q,r are reciprocal vectors, then (la+mb+nc).(lp+mq+nr) is equal to

(a) l+m+n (b) $l^3+m^3+n^3$

(c) $l^2+m^2+n^2$ (d) None of these

38. If the integers m and n are chosen at random from 1 to 100, then the probability that a number of the form 7^n+7^m is divisible by 5, equals to

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$

(c) $\frac{1}{8}$ (d) $\frac{1}{3}$

39. Let X denote the sun of the numbers obtained when two fair dice are rolled. The variance and standard deviation of X are

(a) $\frac{31}{6}$ and $\sqrt{\frac{31}{6}}$

(b) $\frac{35}{6}$ and $\sqrt{\frac{35}{6}}$

(c) $\frac{17}{6}$ and $\sqrt{\frac{17}{6}}$

(d) $\frac{31}{6}$ and $\sqrt{\frac{35}{6}}$

40. A four digit number is formed by the digits 1,2,3,4 with no repetition. The probability that the number is odd, is

(a) zero (b) $\frac{1}{3}$

(c) $\frac{1}{4}$ (d) None of these