

Mathematics

Class: XII

Total Marks: 100

General Instructions:

1. All questions are compulsory.
2. Section A comprises of 10 questions carrying 1 mark each.
3. Section B comprises of 12 questions carrying 2 marks each.
4. Section C comprises of 19 questions carrying 4 marks each.
5. Section D comprises of 6 questions carrying 6 marks each.
6. Use of a calculator is not allowed

SUBJECT: Mathematics

Maximum Marks: 100

Class: XII

SECTION – A

Answer the following questions each carries one mark: -

(10 × 1 = 10)

1. How much should be subtracted to the equation $x^2 - 6x + 10$ to form equal and real roots:
a) -1
b) 1
c) 3
d) -3
2. $10(12x + 2y + 4z) = 0$ if $x = 2, y = 1$ then value of z will be _____
3. A triangle has vertices as $A(a_1, b_1, C_1), B(a_2, b_2, C_2)$, and $C(a_3, b_3, C_3)$ then its area $= \sqrt{\Delta a^2 + \Delta b^2 + \Delta c^2}$ (True/False)
4. If $2x - 2y = 2\pi$. Then $\frac{dy}{dx} =$ _____

5. Find $\frac{dy}{dx}$; if $x = 2t^2 + 4t$ and $y = 4t$

a) $\frac{1}{t+1}$

b) $\frac{1}{t-1}$

c) $\frac{t}{t-1}$

d) $\frac{t}{t+1}$

6. Evaluate $\int_0^2 \frac{1}{3x+2}$

a) $\frac{\log 6}{3}$

b) $\frac{2\log 6}{3}$

c) $\frac{\log 2}{3}$

d) $\frac{2\log 3}{4}$

7. If two indefinite integrals with same derivatives lead to the same family of curves and so they are equivalent (True/False)

8. $\int_0^2 e^{2-x} dx$; $e = 7.3890$

a) $e^2 - 1$

b) $e - 1$

c) $e - 2$

d) $e^2 - 2$

9. Which slope is best suited for the tangent of the curve $y = 3x^3 - 6x$ at $x = 3$

a) 18

b) 36

c) 75

d) 54

10. Find the equation of the tangent to the curve $y = \frac{x}{(x-1)(x-9)}$. At point where it crosses the X-axis.

- a) $9y = x$
- b) $9x = y$
- c) $3y = x$
- d) $3x = y$

SECTION-B

Answer the following questions each carries two marks: -

$9 \times 2 = 18$

Answer any two out of three:

11. A car is traveling to Lucknow which is 16 km away from its current position after reaching Lucknow; it again travels to Charbagh railway station which is 9 km away at $3 \frac{\text{km}}{\text{hr}}$ more than its previous speed. So find the original speed of the car when travelling to Lucknow. Total time taken = 5 hours.

12. Ram pays Rs.200 in his first term of loan payment, then Rs.400 in his second term and then 1200 in his last term. For how many terms should the loan payment be paid?

13. The ratio of x^{th} term and $(x + y)^{th}$ term is 3:4, in an arithmetic series so find the value of y^{th} term if $a = 3$.

14. a) What is the distance from $P(1,3)$ to $Q(2,8)$ and also state the midpoint of the line.

(or)

b) Find the area of the circle where AB is the diameter of the circle where $A = (1,5)$ and $B = (3, -5)$.

15. a) If $\frac{y-x^2}{3} + yx - 7$, then $\frac{dy}{dx}$ is

(or)

b) Differentiate $x^{\sin x}$; $-\infty < x < \infty$

16. a) Evaluate $\int \frac{6x}{(2x-1)(x-10)}$

(or)

b) Evaluate $\int_0^2 \frac{3x}{e^{x-8}} dx$

17. a) Find the general solution of the differential equation $\frac{dy}{dx} = \frac{2x+1}{y-3}$; $y \neq 3$

(or)

b) Find the equation of the curve of a slope of tangent passing anytime through point $(1,-2)$ of the curve is $\frac{2x+3}{3y^2}$

Answer any three out of five:

18. The volume of a cone increases at a rate of $6 \frac{\text{cm}^3}{\text{sec}}$ with constant radius of 3 cm. How fast the Surface area of the cone increases when the height of the cone is 4 cm.

19. Find the interval in which function F given by $f(x) = x^2 - 8x + 16$ is strictly increasing and strictly decreasing.

20. Find the approximate value of $f(5.09)$ where $f(x) = 4x^2 + 3x - 9$.

21. IF MC, OD are 2 poles at 30m distance apart with a height of 14m and 24m resp. Then find the distance of N from either side of C&D; in case of $MN^2 + NQ^2$ is minimum.

22. A deer is running along the curve $y = x^2 + 4$. A hunter who is standing at (1, 1) and wants to shoot the deer. So what is the closest distance that the hunter can make the shot?

SECTION- C

Answer the following questions each carries four marks:

$12 \times 4 = 48$

Answer any two out of three:

23. The ratio between the n th term of the series and the first term is 5:2 and the ratio between the common difference and the first term is 1:4. So how many terms are there in the series. Also find the sum of another series whose first term is 20 and common difference is 2 and the number of terms is equal to the first series.

24. The second term from the last of the series is equal to 36 whereas the second term of the series is 20. If the third term from the last is 32 then find the sum of the series.

25. The area of a rectangular park is 144 m^2 . If the length of the park is 7 m more than the breadth then, what is the cost of laying a boundary wall, if it takes Rs.10/m for boundary layer work.

Answer any two out of three:

26. Find Prove that the equation $2x^2 + 4xy + 2y^2 + 8x + 8y - 10$ gives 2 parallel lines and also find the equation of those parallel lines.

27. Find the value of k in the equation $8x^2 + 2xy - 4y^2 - 24x + 6y + 2k = 0$ so that the value of k may present pair of straight lines.

28. Find the length of the perpendicular that fall on straight line upon a given point. The point lines in the midpoint of C and D which is F(4,5). The straight line is given by equation $(2 \cos 30^\circ + 3 \sin 30^\circ - 2 = 0)$

Answer any two out of three:

29. Solve the Integral: $\frac{(3x^2+7x+4)}{(x-2)^2(x-2)} dx$

30. Solve $\frac{x}{(x+3)^2+(x-3)^2} dx$

31. Evaluate $\int_{-1}^3 4x^2 + 3x\sqrt{x^2+1} dx$

Answer any two out of three:

32. Find the general equation of the differential equation: $(x + 3y) \frac{dy}{dx} = (2x + y)$.

33. Solve $\frac{dy}{dx} = \frac{(2x^2 + 3y^2)}{xy}$

34. Solve the particular differential equation $\frac{dy}{dx} + 2x^2y = (3x + 2)$

Answer any four out of seven:

35. A bomb explodes in the air forming a sphere of fire and energy wave at a rate of $20m^3/sec$. How fast the surface area of the explosion is increasing, if the outer edge is 10m.

36. While fitting 3 hemisphere together of radius 10 cm in a box; there was an error of 0.04 cm due to which the hemisphere did not fit in the box. So how much extra space is required for the 3 hemispheres.

37. Find the maxima and minima of the function $x^3 + 5x^2 + 6x + 1$

38. Calculate the area of the circle formed by the coordinates of maxima and minima of the curve $x^3 + 3x^2 - 9x + 10$.

39. A pipe is fitted at the bottom of a cylinder shaped water tank with vertical axis. Water is poured into the cylinder at a constant rate of $10cm^3$ per hour. Find the rate at which water level is rising at an instant when the water height in the tank is 6cm from the bottom. (The radius of the cylinder is half of its height.)

40. Show that function f given by $f(x) = \sin^{-1}(\cos 2x + \cos x)$; $x \neq 0$ is strictly increasing for $(\frac{3\pi}{2}, \pi)$.

41. A shopkeeper sells $(\frac{x}{5})$ items at a price Rs. $(100 - \frac{x}{500})$ each. If the cost price of the total x items is Rs. $(\frac{x}{500} + 200)$, then calculate the profit in this transaction.

SECTION – D

Answer the following questions each carries 6 marks:-

$$4 \times 6 = 24$$

42.

a) Using matrix method, determine whether the following system of equations is consistent or inconsistent. If consistent, then solve the following system.

$$6x + 4y + 2z = 20$$

$$8x + 2y + 6z = 30$$

$$3x + 3y + 3z = 18$$

(or)

b) If $\begin{bmatrix} 5 & 15 & -10 \\ -15 & 0 & -5 \\ 10 & 5 & 0 \end{bmatrix}$ then find A^{-1} by using elementary transformations.

43.

a) Differentiate $\frac{5x^2}{1-9x^8}$ with respect to $15x^3 + 81$.

(or)

b) Solve the differential equations: $(u - \sqrt{uv})dv = vdu$

Answer any two out of four:

44. Evaluate: $\int_0^2 \frac{2x+5}{3x^2+16} dx$

45. Solve: $\int \frac{dx}{x^4+81}$

46. Evaluate: $\int \frac{dx}{(4-x)(x^2+6)}$

47. Evaluate: $\int \frac{dx}{6+4\sin x + \cos x}$

