



INDIAN SCHOOL AL WADI AL KABIR

Class XII, Mathematics

Worksheet- A.O.I and D.E.

12 - 10 - 2026

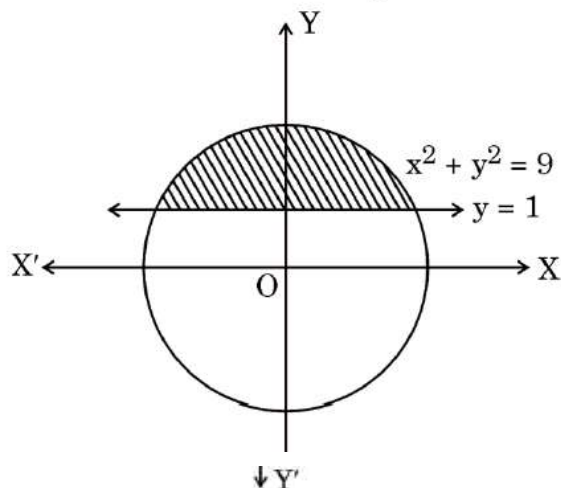
- Q.1. The general solution of the differential equation $xdy - ydx = 0$ is
- (A) $x^2 - y^2 = k$ (B) $xy = k$
(C) $x = ky$ (D) $\log y + \log x = k$
- Q.2. The integrating factor of the differential equation $2x \frac{dy}{dx} - y = 3$ is
- (A) $\sqrt{x}$ (B) $\frac{1}{\sqrt{x}}$
(C) e^x (D) e^{-x}
- Q.3. Which of the following is **not** a Linear Differential Equation ?
- (A) $(1 + x^2) dy + 2xy dx = \cot x dx$
(B) $y + \frac{d}{dx}(xy) = x(\sin x + \log x)$
(C) $x(1 + y^2) dx - y(1 + x^2) dy = 0$
(D) $y dx - (x + 3y^2) dy = 0$
- Q.4. The order and degree of the differential equation $1 + \left(\frac{d^3y}{dx^3}\right)^3 = \lambda \frac{d^2y}{dx^2}$ is :
- (A) Order = 3, Degree = 3 (B) Order = 2, Degree = 2
(C) Order = 3, Degree = 1 (D) Order = 2, Degree = 1
- Q.5. The general solution for the differential equation $\frac{dy}{dx} = e^{3x-y}$ is :
- (A) $3e^y = e^{3x} + C$ (B) $\log(3x - y) = C$
(C) $e^{3x-y} = C$ (D) $-e^y + 3e^{3x} = C$

- Q6. The number of arbitrary constants in the general solution of the differential equation

$$\frac{dy}{dx} + y = 0 \text{ is :}$$

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

- Q7. The area of the shaded region of the circle given below is equal to :



- (A) $\int_1^3 \sqrt{9-y^2} dy$ (B) $2 \int_1^3 \sqrt{9-y^2} dy$
(C) $\int_0^3 \sqrt{9-x^2} dx$ (D) $2 \int_0^3 \sqrt{9-x^2} dx$

- Q8. An ant is observed crawling on a sheet of paper along a straight line given by equation $y = 2x - 4$. Area of the surface covered by the ant bounded by y-axis, x-axis and $x = 1$ is :

- (A) 1 sq. unit (B) 3 sq. units
(C) 2 sq. units (D) 4 sq. units

Q9. The area bounded by the curve $y = x|x|$, x -axis and the ordinates $x = -1$ and $x = 1$ is given by

- (A) 0 (B) $\frac{1}{3}$
(C) $\frac{2}{3}$ (D) $\frac{4}{3}$

Q10. *Assertion (A)* : One of the particular solutions of the differential equation $\frac{dy}{dx} = e^{x+y}$ can be $e^x + e^{-y} = -2$.

Reason (R) : $e^x + e^{-y} = C$ is the general solution of the differential equation $\frac{dy}{dx} = e^{x+y}$.

- | | | | |
|---|--|---|--|
| A | (A) and (R) are true and R is the correct explanation of (A) | B | (A) and (R) are true and R is not the correct explanation of (A) |
| C | (A) is true but (R) is false | D | (A) is false but (R) is true |

Q11. Solve the following differential equation :

$$x \frac{dy}{dx} = y - x \sin^2 \left(\frac{y}{x} \right), \text{ given that } y(1) = \frac{\pi}{6}.$$

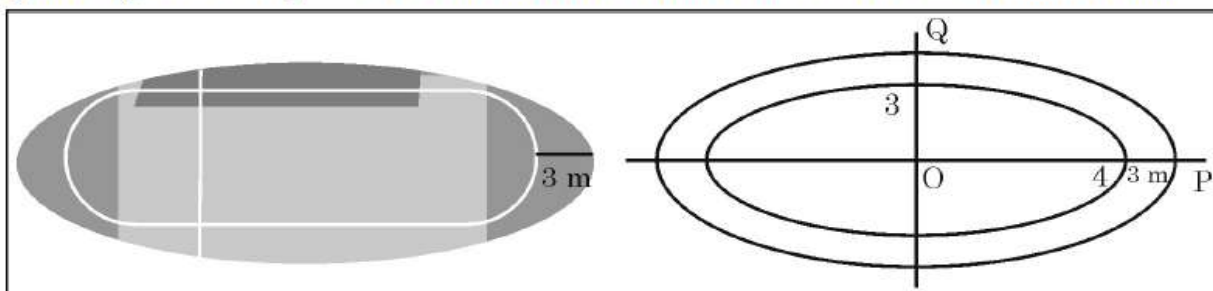
Q12. Find the general solution of the differential equation : $y \log y \frac{dx}{dy} + x = \frac{2}{y}$.

Q13. Find the general solution of the differential equation $2x^2 \frac{dy}{dx} = y^2 + 2xy$.

Q14. Find a particular solution of the differential equation $(x+1) \frac{dy}{dx} = 2e^{-y} - 1$, given that $y = 0$ when $x = 0$.

Q15. Solve the differential equation $y e^y dx = (y^3 + 2x e^y) dy$, when $y(0) = 1$.

- Q16. Solve the differential equation $y e^y dx = (y^3 + 2x e^y) dy$, when $y(0) = 1$.
- Q17. Solve the differential equation $(x + 2y^3) dy = y dx$.
- Q18. Using integration, find the area of the ellipse $\frac{x^2}{16} + \frac{y^2}{4} = 1$, included between the lines $x = -2$ and $x = 2$.
- Q19. Using integration, find the area of the region enclosed by the curve $y = |x - 6|$, the x-axis, and between $x = 4$ and $x = 8$.
- Q20. A racing track is build around an elliptical ground whose equation is given by $9x^2 + 16y^2 = 144$. The width of the track is 3 m as shown below :



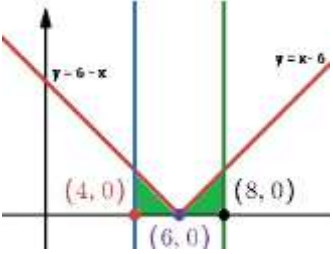
Based on given information, answer the following questions :

- (i) Express y as a function of x from the given equation of ellipse.
- (ii) Integrate the function obtained in (i) with respect to x .
- (iii) (a) Find the area of the region enclosed within the elliptical ground excluding the track using integration.

OR

- (iii) (b) Write the co-ordinates of the points P and Q where the outer edge of the track cuts x axis and y axis in first quadrant and find the area of the triangle formed by points P , O , Q using integration.

ANSWER KEY

Q1	C	Q2	B	Q3	C	Q4	A	Q5	A
Q6	B	Q7	B	Q8	B	Q9	C	Q10	D
Q11	$\cot\left(\frac{y}{x}\right) = \log x + \sqrt{3}$								
Q12	$xy \log y = -2 + Cy$								
Q13	$-\frac{x}{y} = \frac{1}{2} \log x + c$								
Q14	$\log x+1 + \log 2-e^{-y} = 0$								
Q15	$\frac{3}{4} \log \left \frac{y^2 - x^2}{y^2 + x^2} \right - \frac{1}{4} \log \left \frac{y^4 - x^4}{x^4} \right = \log x + c$								
Q16	$x = y^2 (e^{-1} - e^{-y})$								
Q17	$x = y^3 + Cy$								
Q18	$4\sqrt{3} + 8\frac{\pi}{3}$								
Q19	 Area = 4 sq. units								
Q20	(i) $9x^2 + 16y^2 = 144 \Rightarrow y = \frac{3}{4} \sqrt{16 - x^2}$ (ii) $\int y dx = \int \frac{3}{4} \sqrt{16 - x^2} dx$ $= \frac{3}{4} \left[\frac{x}{2} \sqrt{16 - x^2} + 8 \sin^{-1} \left(\frac{x}{4} \right) \right] + C$ (iii) a) Area = 12π b) P(7,0) and Q(0,6) and Required area = 21 sq. unit								
