

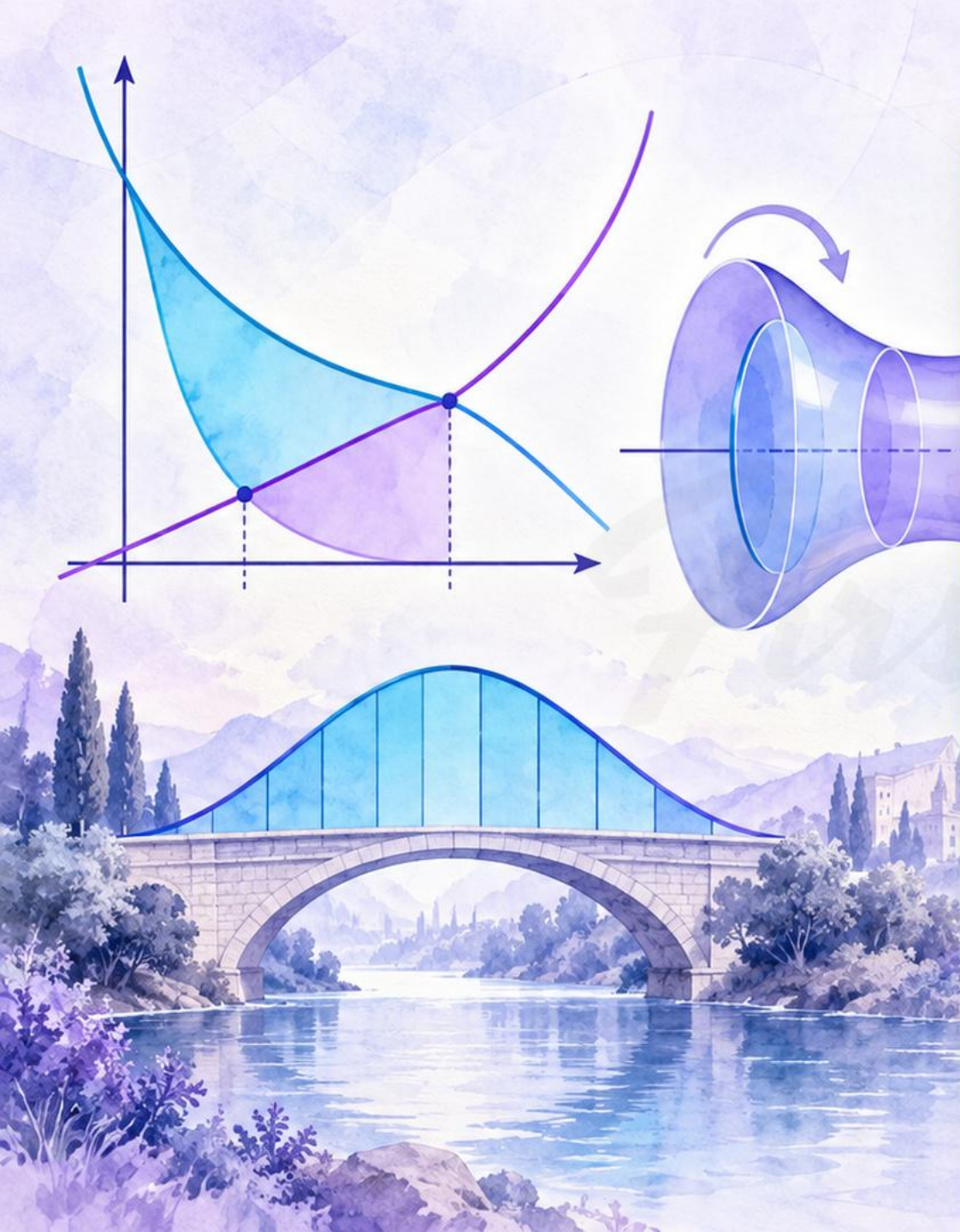
MATHEMATICS • CLASS 12

8

CHAPTER

Applications of Integrals

NCERT SOLUTIONS



AREA OF AN ELLIPSE – EXERCISE 8.1 Q1

Q. Find the area of the region bounded by $\frac{x^2}{16} + \frac{y^2}{9} = 1$.

Answer:

Identify the semi-axes

The standard ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ has area πab . Here $a^2 = 16$ and $b^2 = 9$, so $a = 4$ and $b = 3$. Both are lengths and therefore positive.

Apply the area formula

$$\text{Area} = \pi ab = \pi(4)(3) = 12\pi.$$

Hence, area = 12π square units.

AREA OF AN ELLIPSE – EXERCISE 8.1 Q2

Q. Find the area of the region bounded by $\frac{x^2}{4} + \frac{y^2}{9} = 1$.

Answer:

Compare with the standard ellipse

For $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, the enclosed area is πab .

Here $a^2 = 4$ and $b^2 = 9$, giving semi-axes $a = 2$ and $b = 3$.

Substitute

$$\text{Area} = \pi ab = \pi(2)(3) = 6\pi.$$

Hence, area = 6π square units.

FIRST-QUADRANT CIRCLE AREA — EXERCISE 8.1 Q3

Q. Find the area in the first quadrant bounded by $x^2 + y^2 = 4$ and the lines $x = 0$ and $x = 2$. Options: (A) π ; (B) $\frac{\pi}{2}$; (C) $\frac{\pi}{3}$; (D) $\frac{\pi}{4}$.

Answer:

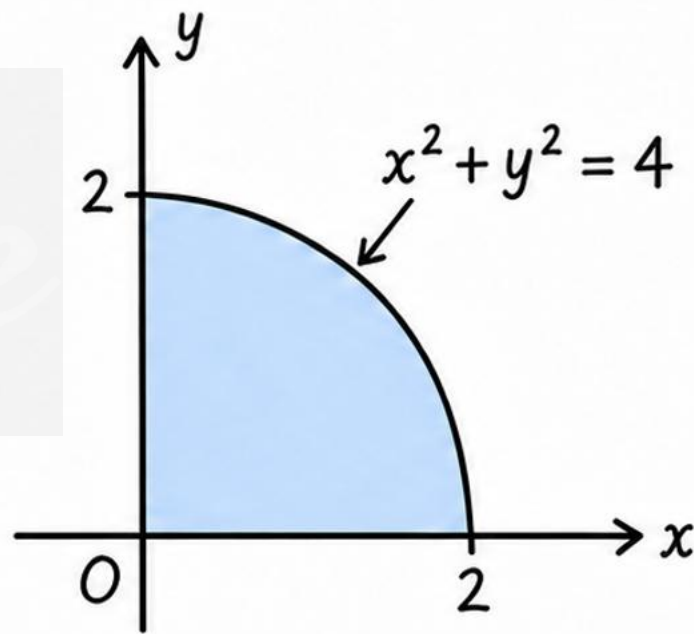
Recognize the region

The circle has centre at the origin and radius $r = 2$. In the first quadrant, the specified region is exactly one quarter of the disk.

Calculate one-quarter of the circle

$$\text{Area} = \frac{1}{4} \pi r^2 = \frac{1}{4} \pi (2)^2 = \pi.$$

Hence, (A) π square units.



AREA BESIDE A PARABOLA — EXERCISE 8.1 Q4

Q. Find the area bounded by $y^2 = 4x$, the y -axis and $y = 3$.

Options: (A) 2; (B) $\frac{9}{4}$; (C) $\frac{9}{3}$; (D) $\frac{9}{2}$.

Answer:

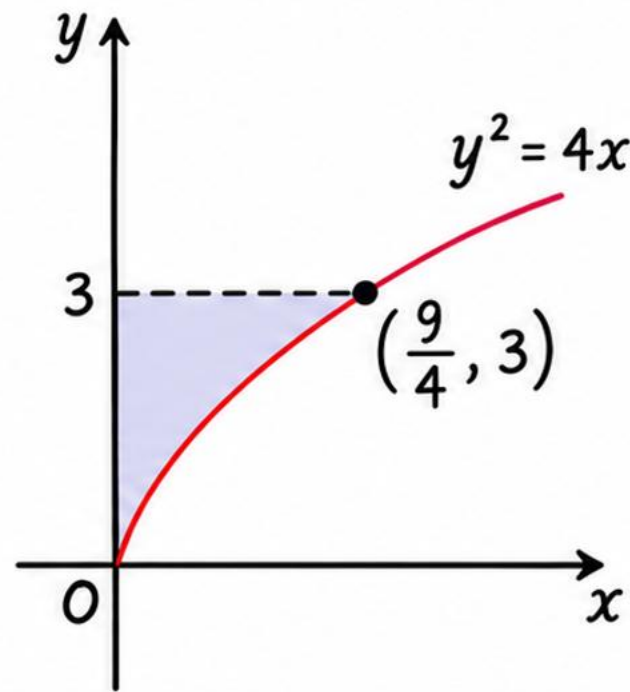
Integrate horizontal strips

The parabola is $x = \frac{y^2}{4}$ and the y -axis is $x = 0$. The boundary $y = 3$ meets the parabola at $x = \frac{9}{4}$. The enclosed region lies between $y = 0$ and $y = 3$.

Compute the area

$$\begin{aligned}\text{Area} &= \int_0^3 (\text{right } x - \text{left } x) dy = \int_0^3 \frac{y^2}{4} dy \\ &= \left[\frac{y^3}{12} \right]_0^3 = \frac{27}{12} = \frac{9}{4}.\end{aligned}$$

Hence, (B) $\frac{9}{4}$ square units.





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