9-9.2-27

AI24BTECH11003 - Badde Vijaya Sreyas

Question:
Find the area bounded by the curve $4y = 3x^2$ and the line $2y = 3x + 12$.
Solution:

Information	Equation
Parabola	$4y = 3x^2$
Line	$2y = 3x + 12$

TABLE 0: Information

The given curve can be expressed as a conic of parameters

$$v = \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}, u = \begin{pmatrix} 0 \\ -\frac{2}{3} \end{pmatrix}, f = 0 \tag{0.1}$$

The given line parameters are

$$h = \begin{pmatrix} 0 \\ 6 \end{pmatrix}, m = \begin{pmatrix} 1 \\ \frac{3}{2} \end{pmatrix} \tag{0.2}$$

From (**??**), the points of intersection of line and conic are

$$\mathbf{x_1} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}, \mathbf{x_2} = \begin{pmatrix} 4 \\ 12 \end{pmatrix} \tag{0.3}$$

As you can see in the figure, the area bounded by the curve $4y = 3x^2$ and the line $2y = 3x + 12$ is given by

$$\int_{-2}^{4} \left(\frac{3x + 12}{2} - \frac{3x^2}{4} \right) dx = 27 \tag{0.4}$$
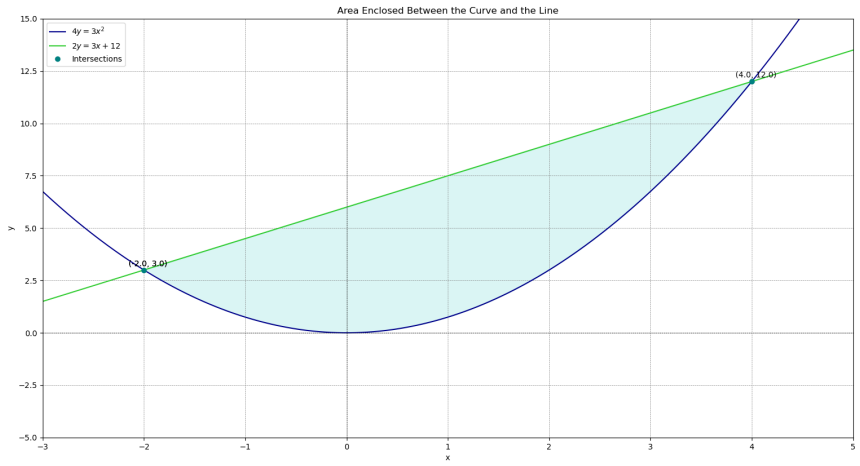
Fig. 0.1: Area Enclosed