

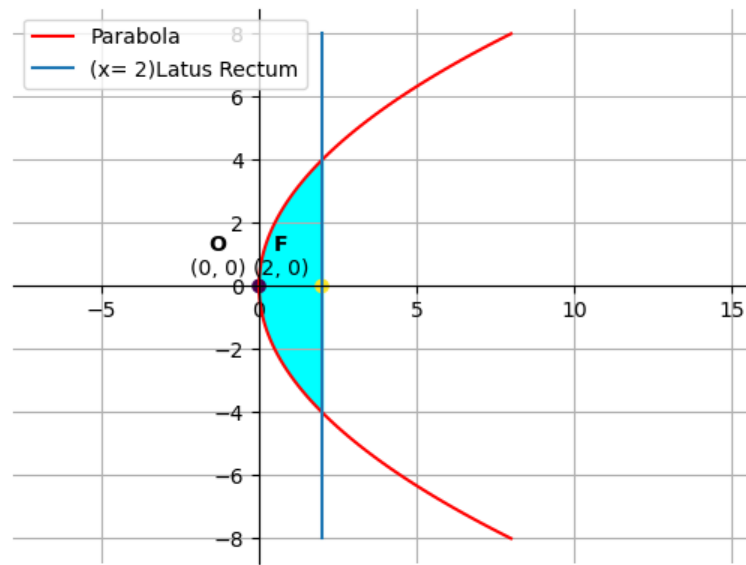
9.2.34

AI25BTECH11001 - ABHISEK MOHAPATRA

Question: Find the area of region bounded by the line $x = 2$ and the parabola $y^2 = 8x$.

Solution:

Graph:



From the given information, the parameters of the parabola and line are

$$\mathbf{V} = \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix}, \mathbf{u} = \begin{pmatrix} -4 \\ 0 \end{pmatrix}, f = 0, \mathbf{h} = \begin{pmatrix} 2 \\ 0 \end{pmatrix}, \mathbf{m} = \begin{pmatrix} 0 \\ 1 \end{pmatrix} \quad (1)$$

Substituting from the above in (9.1.1.3),

$$k_i = 4, -4 \quad (2)$$

yielding the points of intersection

$$\mathbf{a}_0 = \begin{pmatrix} 2 \\ 4 \end{pmatrix}, \mathbf{a}_1 = \begin{pmatrix} 2 \\ -4 \end{pmatrix} \quad (3)$$

Thus, the area of the parabola in between the lines $x = 2$ is given by

$$\int_0^2 \sqrt{8x} = \frac{16}{3} \quad (4)$$