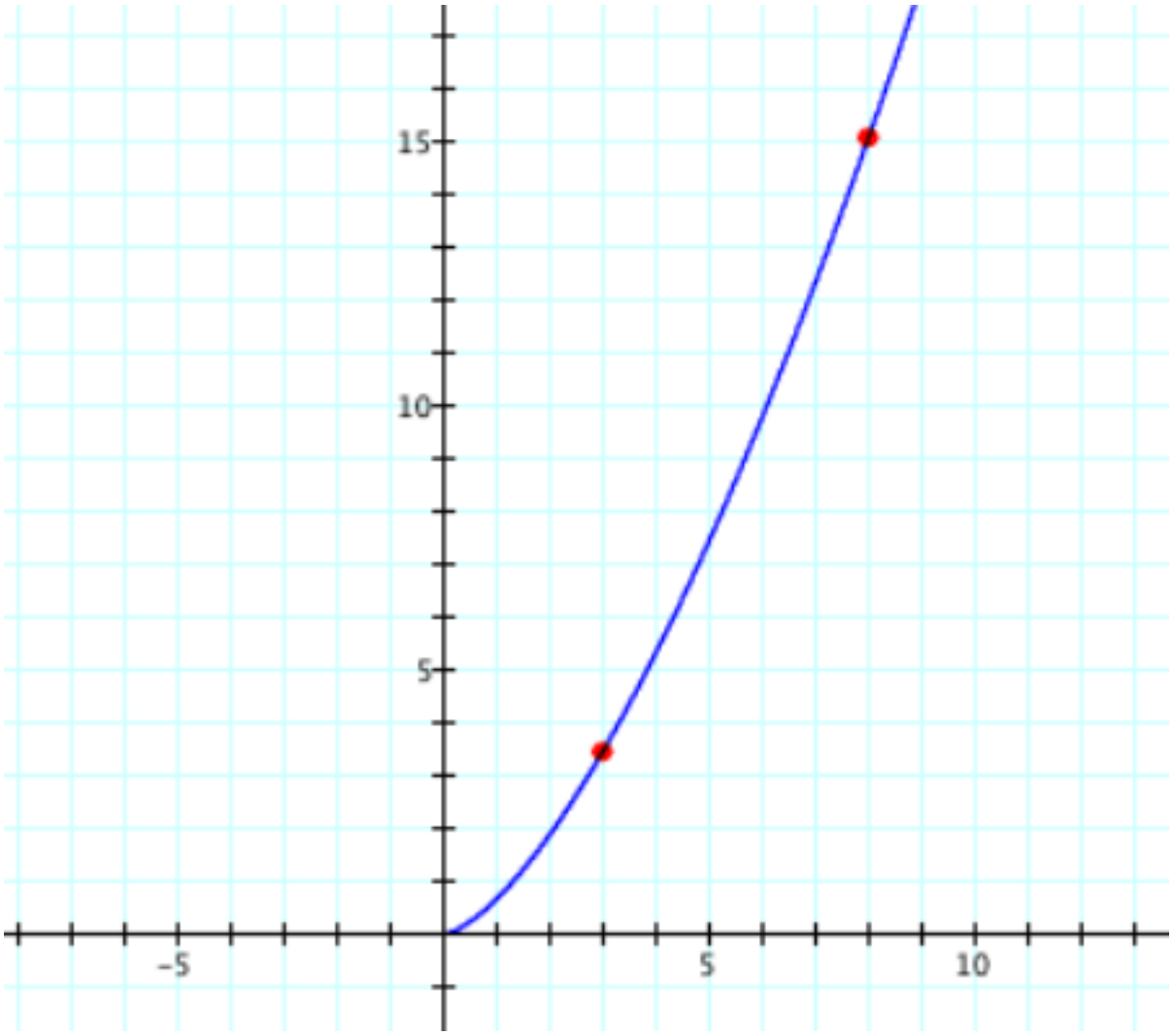
$$\mathcal{L} = \int_a^b \sqrt{1 + (f'(x))^2}$$

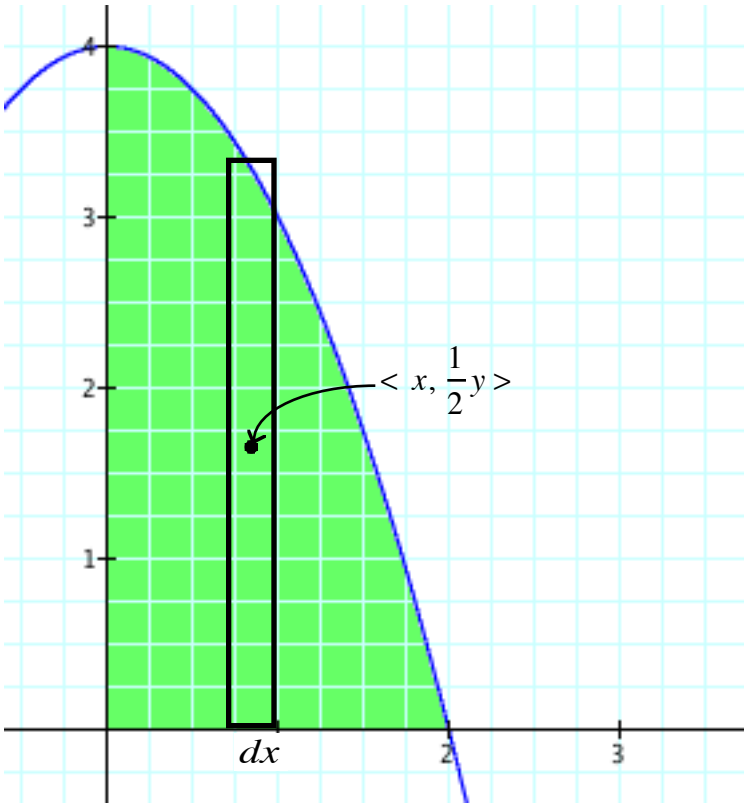
- Find the length of the arc of the curve $y = \frac{2}{3}x^{\frac{3}{2}}$ from $x = 3$ to $x = 8$.



$$\langle \bar{x}, \bar{y} \rangle = \left\langle \frac{M_y}{A}, \frac{M_x}{A} \right\rangle$$

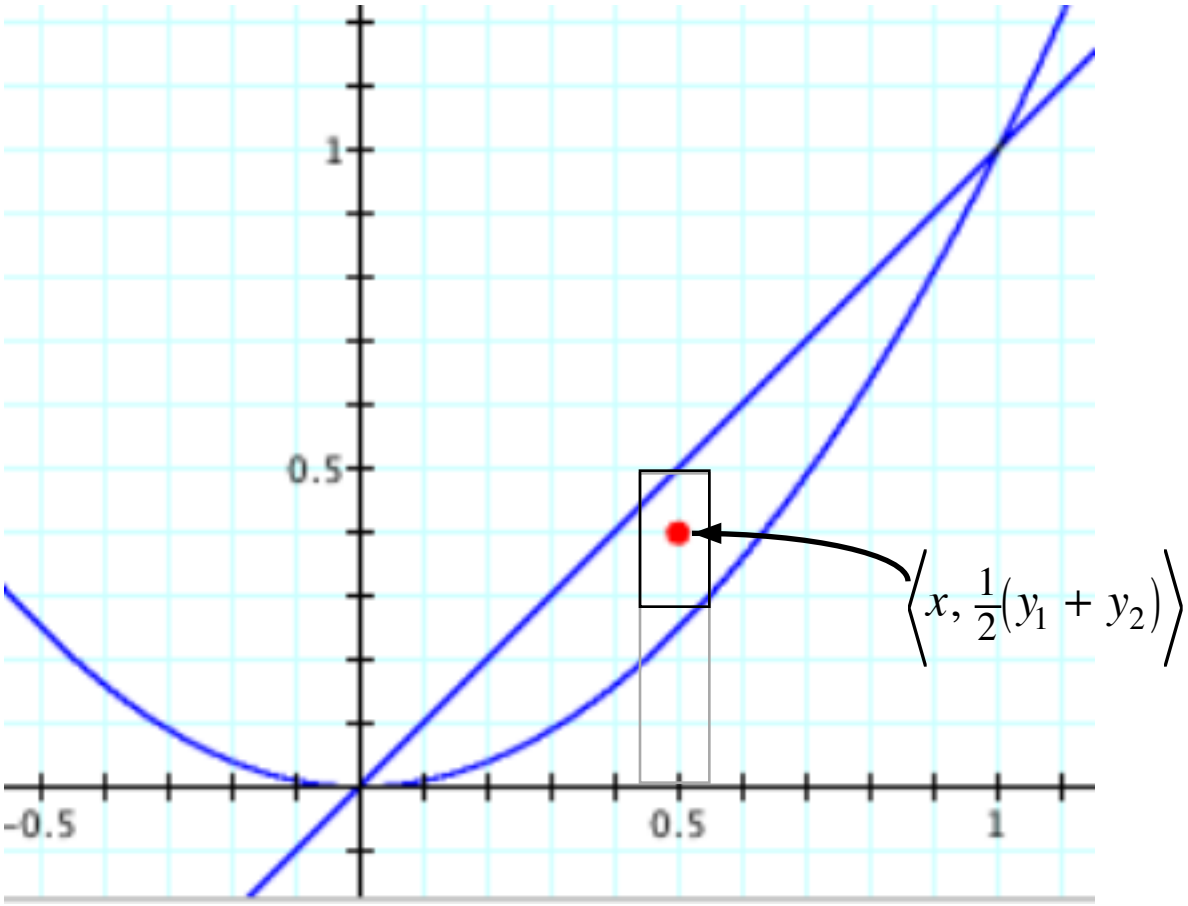
$$M_y = \int_a^b dist_{y-axis}(A) = \int_a^b x \cdot (ydx)$$

$$M_x = \int_a^b dist_{x-axis}(A) = \int_a^b \frac{1}{2} y \cdot (ydx)$$

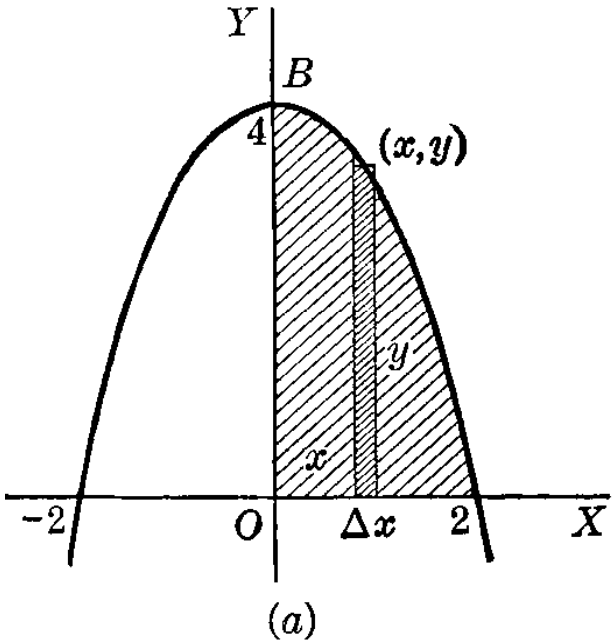


- Determine the centroid of the first quadrant area bounded by $y = 4 - x^2$.

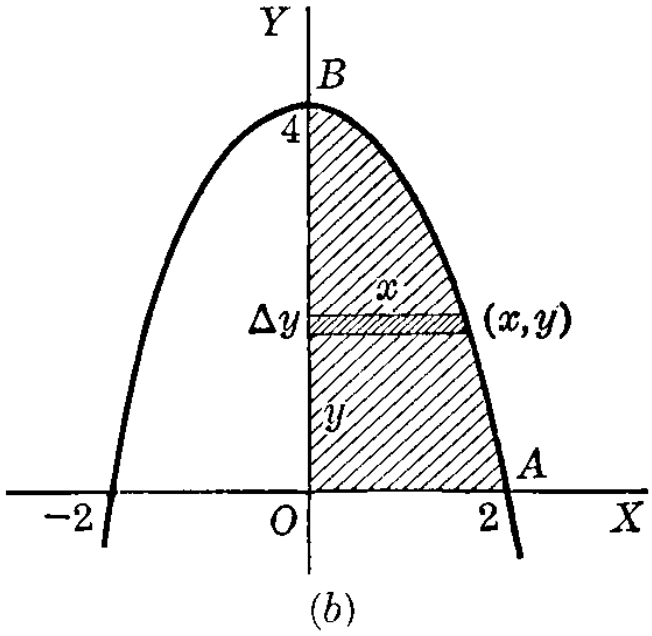
- Find the centroid of the first quadrant area bounded by the parabola $y = x^2$ and the line $y = x$.



- Find the second moment with respect to the x-axis and the y-axis of the first quadrant area bounded by $y = 4 - x^2$



(a)



(b)

$$I_y = A\bar{x}^2 = \int x^2 y\,dy \qquad I_x = A\bar{y}^2 = \int y^2 x\,dy$$