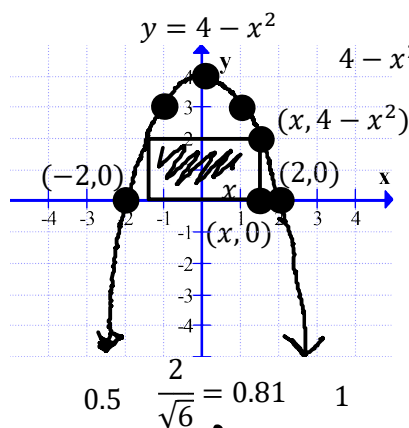


C12 - 3.8 - Area Under Graph/Shapes Max/Min Notes

Max rectangle area under $y = 4 - x^2$ above x -axis.



$$A = lw$$

$$A = (2x)(y)$$

$$A = 2x(4 - x^2)$$

$$A = 8x - 2x^3$$

$$A' = 8 - 6x^2$$

$$0 = 8 - 6x^2$$

$$6x^2 = 8$$

$$x^2 = \frac{4}{3}$$

$$x = \pm \frac{2}{\sqrt{3}}$$

$$A = 2x(y)$$

$$A = 2\left(\frac{2}{\sqrt{3}}\right)\left(\frac{8}{3}\right)$$

$$A = \frac{32}{3\sqrt{3}}$$

Domain
 $x - \text{int}, y = 0$

$$y = 4 - x^2$$

$$0 = 4 - x^2$$

$$x^2 = 4$$

$$x = \pm 2$$

$$(\pm 2, 0)$$

$$x \geq 0 \quad x \leq 2$$

$$0 \leq x \leq 2$$

$$y = 4 - x^2$$

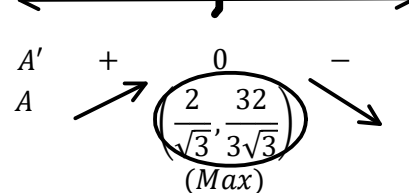
$$y = 4 - \left(\frac{2}{\sqrt{3}}\right)^2$$

$$y = 4 - \frac{4}{3}$$

$$y = \frac{8}{3}$$

$$y = \frac{8}{3}$$

$$\left(\frac{2}{\sqrt{3}}, \frac{8}{3}\right)$$



$$A' = 8 - 6x^2$$

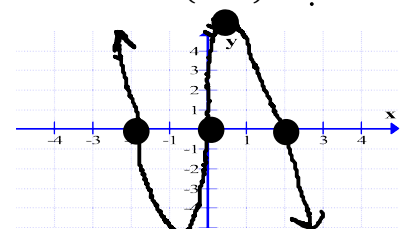
$$A' = 8 - 6\left(\frac{1}{2}\right)^2$$

$$A' = +ve$$

$$A' = 8 - 6x^2$$

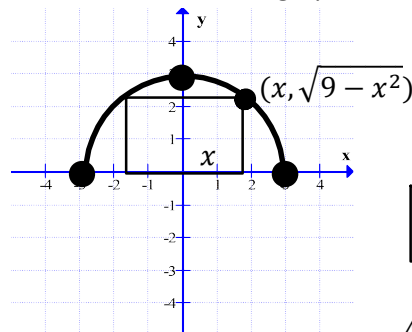
$$A' = 8 - 6(1)^2$$

$$A' = -ve$$



$$A = 2x(2 + x)(2 - x)$$

Max area under circle graph



Equation of Circle

$$x^2 + y^2 = r^2$$

$$x^2 + y^2 = 3^2$$

$$x^2 + y^2 = 9$$

$$y = \pm \sqrt{9 - x^2}$$

$$A = 2x\sqrt{9 - x^2}$$

$$A = 2(2.16)\sqrt{9 - (2.16)^2}$$

$$A = 9 \text{ units}^2$$

$$A = lw$$

$$A = 2x\sqrt{9 - x^2}$$

$$A' = 2\sqrt{9 - x^2} - \frac{2x}{\sqrt{9 - x^2}}(2x)$$

$$0 = 2\sqrt{9 - x^2} - \frac{4x^2}{\sqrt{9 - x^2}}$$

$$2\sqrt{9 - x^2} = \frac{4x^2}{\sqrt{9 - x^2}}$$

$$9 - x^2 = 2x$$

$$x = 2.16 \text{ units} \approx 4.16$$