



October 28

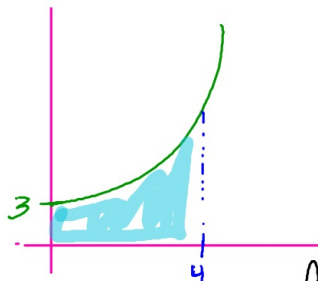
SWBAT:

Find the area between  
two curves

Essential Learning Goals:

- 😊 Use Integrals to solve a variety of problems
  - 😊 Find the area of a region
  - 😊 Find the volume of a solid with known cross sections
  - 😊 Find the volume of a solid by rotation about an axis
- 😊 Find the average value of a function

Find the area  
bounded by  
 $f(x) = 0.5x^2 + 3$   
 $x = 4$   
and the y-axis



$$A = \int_0^4 0.5x^2 + 3 \, dx = \left. \frac{0.5x^3}{3} + 3x \right|_0^4$$

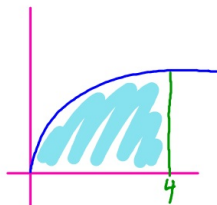
$$= \frac{0.5(4)^3}{3} + 3(4) - \left( \frac{0.5(0)^3}{3} + 3(0) \right)$$

$$= 22.667$$

$$\frac{d}{dx} (?) = 0.5x^2 + 3$$

$$? = \frac{0.5x^3}{3} + 3x$$

Find the area  
bounded by  
 $g(x) = \sqrt{x}$   
 $x = 4$   
and the y-axis



$$A = \int_0^4 \sqrt{x} \, dx$$

$$= \int_0^4 x^{1/2} \, dx = \left. \frac{x^{3/2}}{3/2} \right|_0^4$$

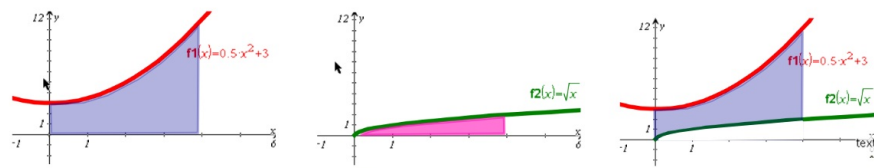
$$= \frac{2}{3} x^{3/2} \bigg|_0^4$$

$$= \frac{2}{3} (4)^{3/2} - \frac{2}{3} (0)^{3/2}$$

$$= \frac{2}{3} (\sqrt{4})^3$$

$$= \frac{2}{3} (2)^3 = \frac{2 \cdot 8}{3} = \frac{16}{3}$$

Find the area  
bounded by  
 $f(x) = 0.5x^2 + 3$   
 $g(x) = \sqrt{x}$   
 $x = 4$   
and the y-axis



$$\int_0^4 .5x^2 + 3 dx - \int_0^4 \sqrt{x} dx$$

$$= \int_0^4 .5x^2 + 3 - \sqrt{x} dx = 17.333$$

$$22.66667 - \frac{16}{3}$$

Find the area  
bounded by  
 $f(x) = 0.5x^3 - 6x + 7$   
the x-axis and the  
lines  $x = 0$  and  $x = 3$

$$\begin{aligned} A &= \int_0^3 .5x^3 - 6x + 7 dx \\ &= \left. \frac{.5x^4}{4} - \frac{6x^2}{2} + 7x \right|_0^3 \\ &= \frac{.5(3)^4}{4} - \frac{6(3)^2}{2} + 7(3) - 0 \\ &= 4.125 \end{aligned}$$

Find the area

bounded by

$$g(x) = -0.25x^2 + x + 11$$

the x-axis and the

lines  $x = 0$  and  $x = 3$

$$A = \int_0^3 -0.25x^2 + x + 11 \, dx$$

$$= 35.25$$

$$= -\frac{0.25(3)^3}{3} + \frac{3^2}{2} + 11(3) - 0$$

Find the area

bounded by

$$g(x) = -0.25x^2 + x + 11$$

$$f(x) = 0.5x^3 - 6x + 7$$

and the lines  $x = 0$

and  $x = 3$

$$A = \int_0^3 -0.25x^2 + x + 11 - (0.5x^3 - 6x + 7) \, dx$$

$$= 31.125$$

# Area between 2 curves

$$= \int_a^b \left( \underset{\substack{\text{upper} \\ y}}{\text{green}} \right) - \left( \underset{\substack{\text{lower} \\ y}}{\text{red}} \right) \overbrace{dx}^{\text{variable} = x}$$

$\uparrow$  x-values

Find the area  
bounded by  
 $f(x) = 3\cos x$   
 $g(x) = \sin(x) - 4$   
on the interval  
 $(1, 2\pi)$