$\int_0^5 2f(x) - \frac{1}{3}g(x)\,dx$ $\quad \int_0^5 f(x)\,dx = 5$

$\int_0^5 2f(x)\,dx - \int_0^5 \frac{1}{3}g(x)\,dx$ $\quad \int_0^5 g(x)\,dx = 12$

$2\int_0^5 f(x)\,dx - \frac{1}{3}\int_0^5 g(x)\,dx$

$2(5) - \frac{1}{3}(12) = 10 - 4 = 6$

$$\int_0^6 x^2\,dx = \frac{6^3}{3}$$

$$= \frac{216}{3} = 72$$

September 26

SWBAT:

Evaluate definite integrals using the Fundamental Theorem of Calculus

5. The top graph on page 1.4 is the graph of the accumulation function, $y = A(x)$, for the function $f$ from the previous pages, and the bottom graph shows the graph of its derivative, $y = A'(x)$.

   a. Choose several values of $x$ and find the corresponding values of $A'(x)$. For each of these, how do they compare to the value of $f(x)$ for that $x$? What do you observe? Does this make sense? Explain.

   b. Given your response to a, complete the following:
   $f(x)$ is the derivative of $A(x)$.
   $A(x)$ is the antiderivative of $f(x)$.

7. Suppose you are given that an accumulation function for a continuous function $f(x)$ can be expressed as $A(x) = x^2 + 3$. Explain how you can use this to find $\int_2^4 f(x)\,dx$.

$A(4)=4^2+3=19$

$A(2)=2^2+3=7$

$19-7=12$

$A(4)-A(2)$

$f(x)=A'(x)=2x$

$$\int_2^4 f(x)dx = A(4)-A(2)$$

$$\int_0^4 f(x)dx - \int_0^2 f(x)dx$$

8. Based on your answers to questions 5 and 6, how do you think you would find a formula for an accumulation function of a continuous function without using the integral? Explain.

find the antiderivative

9. Using your response to question 8, describe how you would find the value of a definite integral for a continuous function *f*.

Plug in upper bound to antiderivative +

10. Use your response to question 8 to find $\int_0^3 2x\,dx$. Explain your solution. How can you check your work?

Subtract what you get when you plug in the lower bound

10. Use your response to question 8 to find $\int_0^3 2x\,dx$. Explain your solution. How can you check your work?

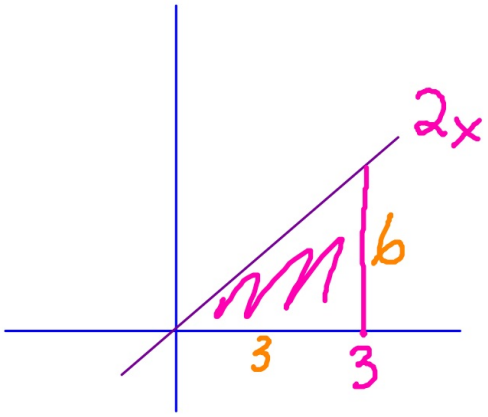
$\frac{d}{dx}(?) = 2x$

$? = x^2$

$A(x) = x^2$

$A(3) - A(0)$

$3^2 - 0^2 = 9$




$A = \frac{1}{2}(3)(6)$

$= 9$

# Fundamental Theorem of Calculus (FTC)

$$\int_a^b f(x)\,dx = A(x)\Big|_a^b = A(b) - A(a)$$

where $A'(x) = f(x)$

$\int_3^7 4x^3\,dx$

$\frac{d}{dx}(?) = 4x^3$

$? = x^4$

$4\left(\frac{x^4}{4}\right)$

$\int_3^7 4x^3\,dx = x^4\Big|_3^7$

$= 7^4 - 3^4 =$

$$\int_1^5 7x^2\,dx$$