A few additional ideas about FTC...

$\int_a^b f(t)\,dt = F(t)\Big|_a^b = F(b) - F(a)$

$\int_c^d g'(p)\,dp = g(p)\Big|_c^d = g(d) - g(c)$

$\int$ – What does it say in words again?

The definite integral measures the total change in the antiderivative.

So, if you integrate the derivative....

What if you differentiate a definite integral?

$$\frac{d}{dx}\int_1^x g(t)\,dt = \frac{d}{dx}\left[G(t)\Big|_1^x\right] = \frac{d}{dx}\left[G(x) - G(1)\right]$$

$g(x) - 0 = g(x)$

$$D_y \int_y^5 m(r)\,dr = D_y\left[M(r)\Big|_y^5\right] = D_y\left[\underset{\text{constant}}{M(5)} - M(y)\right]$$

$0 - m(y)$

$-m(y)$

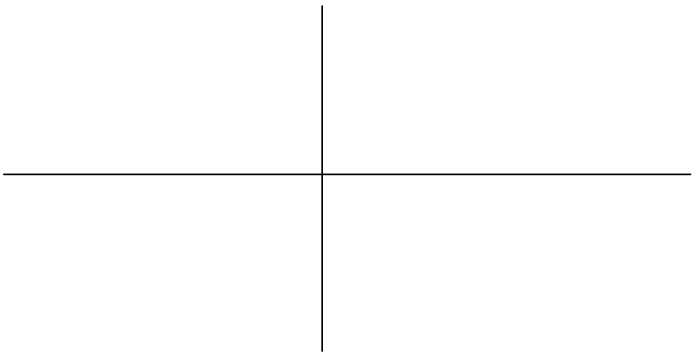
$$\int_1^3 x^3\,dx = \frac{1}{4}x^4\Big|_1^3 = \frac{1}{4}\cdot 3^4 - \frac{1}{4}\cdot 1^4 =$$

$$\int_a^b x^n\,dx = \frac{x^{n+1}}{n+1}\Big|_a^b$$

Graphically….

$$Let \quad p(y) = \int_{1}^{y} m(r)dr$$

Let m be the graph shown. Graph p.



BC Calculus
FTC work

Fundamentalizer: _____

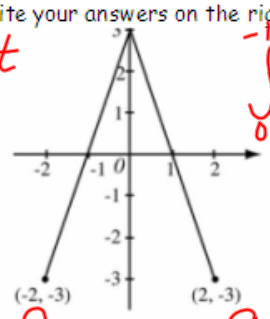
0) Review your three main perspectives of the integral, and know them well!

1) $\frac{d}{dx}\int_a^x f(t)\,dt =$ _____

2) What does the Fundamental Theorem state in words? _____

3) Consider the graph of the function f given here. Make sure you understand how the function g is defined before answering the questions (write your answers on the right side →).

$g(x) = \int_0^x f(t)\,dt$



Graph of f

f g′

The graph of the function f shown above consists of two line segments. Let g be the function given by $g(x) = \int_0^x f(t)\,dt$.

(a) Find $g(-1)$, $g'(-1)$, and $g''(-1)$.

(b) For what values of x in the open interval $(-2, 2)$ is g increasing? Explain your reasoning.

(c) For what values of x in the open interval $(-2, 2)$ is the graph of g concave down? Explain your reasoning.

(d) Sketch the graph of g on the closed interval $[-2, 2]$.

$-\int_0^1 f(t)\,dt$

a) $g(-1) = -\frac{3}{2}$

$g'(x) = D_x g(x) = D_x \int_0^x f(t)\,dt$

$= D_x[F(t)|_0^x] = D_x[F(x) - F(0)]$

$= f(x)$

$g'(-1) = 0$

$g''(-1) = 3$

$g'' < 0$

g' dec

$g' > 0$