Section 5.4:
2nd Fundamental Theorem of Calculus

We talked last class about the accumulation function and it's geometric properties.
Now let's look at some algebra behind it.

Find F(x) and then find F'(x).

$$F(x) = \int_1^a 2x\,dx$$

Find F(x) and then find F'(x).

$$F(x) = \int_{\frac{\pi}{2}}^{x^3} \cos t\,dt$$

The Second Fundamental Theorem of Calculus

$$\frac{d}{dx}\left[\int_a^x f(t)\,dt\right] = f(x)$$

*Taking the derivative of an integral "undo" each other!

Try some of these:

$$\frac{d}{dx}\left[\int_0^x \sqrt{t^2+1}\ dt\right]$$

$$\frac{d}{dx}\left[\int_0^{\sin x} \sqrt{t}\ dt\right]$$

$$\frac{d}{dx}\left[\int_{-2}^x t^2-2t+5\ dt\right]$$

$$\frac{d}{dx}\left[\int_{-2}^{e^x} t\cos t\ dt\right]$$

Find F'(x).

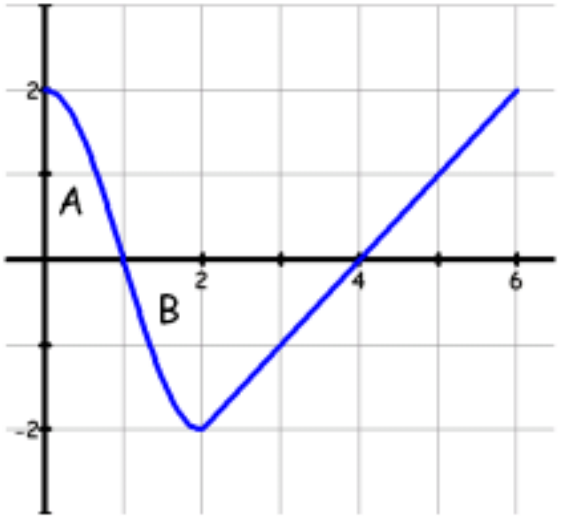
$$F(x) = \int_0^x (t+2)\,dt$$

$$F(x) = \int_{\frac{\pi}{4}}^{2x} \left(\sec^2 t\right) dt$$

$$F(x) = \int_x^{x+2} (4t+1)\,dt$$

$$F(x) = \int_{x^2+1}^{x^2+5} \left(\sin t^2\right) dt$$

Let's put the accumulation function and all it's peices together.



Let $F(x) = \int_1^{2x} f(t)dt$, where the graph of f on the interval [0, 6] is shown at the right, and the regions A (from [0,1]) and B (from [1,2]) each have an area of 1.3.

1. Find F(0) and F(1).

2. Determine F'(x).

3. Determine the critical numbers of F(x) on the interval [0, 3]. Which are max/mins?