

April 15

SWBAT:

*Solve Problems using
Fundamental Theorem of Calculus*

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The Fundamental Theorem of Calculus (FTC)

Assume that $f(x)$, $g(x)$, and $h(x)$ are differentiable functions and that $F(x)$ is an antiderivative of $f(x)$. In other words, assume $F'(x) = f(x)$.

The First Fundamental Theorem of Calculus (1st FTC)

$$\int_a^b f(x) dx = F(b) - F(a)$$

$$\int_a^b f'(x) dx = f(b) - f(a)$$

$$\int_a^b f'(x) dx = f(b) - f(a) \Rightarrow f(b) = f(a) + \int_a^b f'(x) dx$$

Amount = (rate) x (time)

$$\text{Amount} = \int_{\text{beginning time}}^{\text{ending time}} (\text{Rate}) dt$$

Current Amount =

* Initial Amount + $\int_{\text{time 1}}^{\text{time 2}} (\text{Addition Rate}) dt - \int_{\text{time 1}}^{\text{time 2}} (\text{Subtraction Rate}) dt$

Max/Min Amount

$$\text{rate} = 0$$

$$\text{addition rate} - \text{subtraction rate} = 0$$

$$\text{Amount} = \int_0^x R_A - R_S dt$$

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The Second Fundamental Theorem of Calculus (2nd FTC)

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

$$\frac{d}{dx} \int_{g(x)}^{h(x)} f(t) dt = f(h(x)) \cdot h'(x) - f(g(x)) \cdot g'(x)$$