Recall: If we know a function's derivative, then for:

$$f(t) = F'(t)$$

$$\begin{matrix} \textit{area under graph of} \\ \textit{from } t = a \textit{ to } t = b \end{matrix} = \begin{matrix} \textit{change in } F(t) \\ \textit{from } t = a \textit{ to } t \end{matrix} = \int_a^b f(t)dt = \lim_{n\to\infty} \sum_{i=1}^{n} f(t_i) \cdot \Delta t$$

Recall: The units of $f(t) =$ units of $F'(t) = \dfrac{\text{the units of } F(t)}{\text{the units of } t}$

What are the units of $\int_a^b f(t)dt$?

Another point of view:

$$\begin{matrix} \textit{change in } F(t) \\ \textit{from } t = a \textit{ to } t = b \end{matrix} = F(b) - F(a)$$

Fundamental Theorem of Calculus:

$$\int_a^b F'(t)dt =$$

Example: Suppose that you begin your retirement savings with a $\$2000$ deposit. After your initial deposit, you continue to make weekly contributions and accrue interest until you retire. Suppose that amount of money in your retirement account, $R(t)$, grows at a rate of:

$$R'(t) = 5100(e^{.05t})$$

Where t is the number of years that your retirement account has been opened.

How much does your retirement grow in the tenth year?

How much money do you have in your retirement account after 30 years?

Fundamental Theorem of Calculus:

$$\int_a^b F'(t)dt \quad = \quad F(b) - F(a)$$

We saw in the last video that using $a = 0$ we get:

Solving for $F(b)$ this becomes:

Recall: The cost function $C(q)$

$$C(q) = Fixed\ cost + variable\ cost$$

$$C'(q) = MC(q)$$

$C(b) =$

Example: Suppose you are selling tomato plants. You have an up front cost of *$100* with a marginal cost given by:

$$MC(q) = 1 + 2e^{-.1q}$$

How much will is cost to produce 200 plants?