# Lesson 32: The Fundamental Theorem of Calculus (2)

Recall: $\int_a^b f(x)dx = F(b) - F(a)$ where $F'(x) = f(x)$.

So $\underline{F(b) - F(a) = \int_a^b F'(x)dx}$.

Ex 1  If $\frac{dh}{dt} = 1.4t + 7$ models the growth rate of a plant, find how much the plant grows from $t=0$ to $t=5$.

we want $h(5) - h(0) = \int_0^5 \overset{=\frac{dh}{dt}}{h'(t)dt}$

$$= \int_0^5 1.4t + 7\, dt$$

$$= 1.4\left(\tfrac{1}{2}t^2\right) + 7t \Big|_0^5$$

$$= .7(5)^2 + 7(5) - 0$$

$$= \boxed{52.5}$$

Ex 2  Displacement is the change in position.

If $\underset{s'(t)}{v(t)} = 2e^t$, find the $\underbrace{\text{displacement}}_{s(5) - s(0)}$ from $t=0$ to $t=5$.

$s(5) - s(0) = \int_0^5 2e^t\, dt$

$\qquad = 2e^t \Big|_0^5 = \boxed{2e^5 - 2}$

when is the displacement 1?

$\underset{\substack{\text{displacement} \\ \text{at } t=x}}{\underline{s(x) - s(0)}} = \int_0^x 2e^t\, dt = 2e^t \Big|_0^x = 2e^x - 2 \overset{set}{=} 1$

$\qquad\qquad\qquad\qquad\qquad 2e^x = 3$

$\qquad\qquad\qquad\qquad\qquad e^x = \tfrac{3}{2}$

$\qquad\qquad\qquad\qquad\qquad \boxed{x = \ln(3/2)}$