4.4 Videos Guide

4.4a

- Distinction between a definite integral and an indefinite integral
  For $f(x) = F'(x)$:
  - Definite integral: $\int_a^b f(x)\, dx = F(b) - F(a)$, which is a *number*
  - Indefinite integral: $\int f(x)\, dx = F(x) + C$, which is a *function of x*

Exercises:
- Find the general indefinite integral.
  - $\int \left(u^2 + 1 + \frac{1}{u^2}\right) du$
  - $\int \sec t\,(\sec t + \tan t)\, dt$

4.4b

- Evaluate the definite integral.
$\int_0^2 |2x - 1|\, dx$

Theorem (statement):
- Net Change Theorem: The integral of a rate of change is the net change:
$$\int_a^b F'(x)\, dx = F(b) - F(a)$$

Exercises:
- A honeybee population starts with 100 bees and increases at a rate of $n'(t)$ bees per week. What does $100 + \int_0^{15} n'(t)\, dt$ represent?

4.4c

- The velocity function (in m/s) is given for a particle moving along a line. Find (a) the displacement and (b) the distance traveled by the particle during the given time interval.
$v(t) = t^2 - 2t - 3, \;\; 2 \le t \le 4$