Lesson 32: The Fundamental Theorem of Calculus

1. If the velocity of a particle is $v(t) = t^2 - 3t$, find the displacement between $t = 1$ and $t = 7$.

2. Your boat springs a leak at 2pm. Water is leaking into your boat at a rate of $\dfrac{dW}{dt} = 1 + .5t$ gallons per hour, where t is the number of hours after 2pm.

   (a) How much water enters your boat between 2 and 3pm?

   (b) When will there be 5 gallons of water in your boat?

3. You buy a new car in 2017, and the rate of change of value for the first 10 years is given by $\frac{dV}{dt} = 500(t - 10)$, where t is in years after 2017.

   (a) What is the decrease in value over the first five years?

   (b) What is the decrease in value over the *next* five years?

   (Decrease in value is called **depreciation**.)

Answers:

1. 42

2. (a) 1.25 gallons

   (b) When $t = 2.89$ (so around 4:53pm)

3. (a) $18,750$

   (b) $6,250$