Introduction to Related Rates

Another interpretation of the word **derivative** is a *rate* or *rate of change*. A rate expresses a relationship between two measurements of different units such as change in distance with respect to time (e.g. miles per hour).

Suppose *A* represents some quantity that changes over time (for example *A* could represent the area of circular pool of water that is getting larger).

The rate at which *A* is changing can thus be represented by the derivative of *A* with respect to time, *t*. In calculus notation, this would be written $\dfrac{dA}{dt}$.

Exercises:

1. The weight, in kg, of rocket fuel in a rocket launcher is given by $W = \dfrac{1}{t} - \dfrac{4}{t^2}$ where *t* is time in seconds. Find the rate of change in the amount of fuel at time $t = 3$ seconds. (Be sure to include units in your answer.)

2. Represent the answer to each of the questions below in calculus notation.

   a) "At what rate is the profit increasing?" or "How fast is the profit increasing?" or "What is the growth rate of the profit?"

   b) "How fast is the volume of the balloon decreasing?"

   c) "How fast is the distance from home plate decreasing when the man runs from second to third base?"

   d) "At what rate is the number of bacteria increasing once it reaches 2000 bacteria?"

   e) "At what rate is the height of the rocket increasing once it reaches an altitude of 5000 miles?"