## Lesson 8: Instantaneous Rates of Change

## January 26, 2018

- 1. When a rock is thrown into a pond, the area of the ripple is given by  $A(r) = \pi r^2$ , where r is the radius of the ripple in inches. Find the rate of change of the area when the radius is 3 inches.
- 2. For an Amazon drone,  $s(t) = 3t t^2$  miles after t hours.
  - (a) What is v(t)?
  - (b) When is the velocity equal to 2?
  - (c) What is the position at that time?
- 3. The population of rabbits in a given area can be modeled by  $P(t) = 10(5t^2 2t + 100)$ , where t is in months.
  - (a) How quickly is the population increasing after 2 years? (Careful: t was given in months!)
  - (b) In what month is the population increasing at the rate of 1280 rabbits per month?
- 4. Sally builds a lemonade stand. Her profit is given by P(x) = .25x 100, where x is the number of cups of lemonade she sells.
  - (a) What is the rate of change of P with respect to x?
  - (b) What is the rate of change of x with respect to P?

- 1.  $A'(r) = 2\pi r$ , so  $A'(3) = 6\pi$
- 2. (a) v(t) = 3 2t miles/hour
  - (b) v(t) = 2 when t = 1/2 hour
  - (c) s(1/2) = 5/4 miles
- 3. (a) P'(t) = 100t 20 rabbits/month, so P'(24) = 2380 rabbits/month
  - (b) P'(t) = 1280 when t = 13
- 4. (a) .25
  - (b) 4