

Math 34A Winter 2012

Doubling time (again)

Recall: If the initial amount of a substance is A_0 grams and the doubling time is K years, what is the formula that we can use to represent the amount of the substance after t years?

Example. Bacteria are growing exponentially in an environment of unlimited space and food. The doubling time is 2 hours.

a) If there is initially A_0 milli-grams of bacteria, express the mass of bacteria as a function of time t (in hours).

b) Use a) to find how long it takes for the mass of bacteria to triple.

c) If there is 100 milli-grams of bacteria after 3 and a half hours, what is A_0 ?

Derivatives.

What is it?

Examples.

1. Let $f(x) = 3x - 1$. Find $f'(2)$.

2. Let $f(x) = 2x^2 + 1$.

a) Find $f'(a)$ (here a can be any real number).

b) What is the geometric interpretation of $f'(a)$?

c) Find the equation of the tangent line to $y = f(x)$ at $x = 1$.

Average rate of change & Instantaneous rate of change

Suppose $p(t) = \sqrt{t+1}$ represents the position of a particle moving along the x -axis.

1. Find the average velocity of the particle during the time interval $[1, 2]$.

2. Find the average speed of the particle during the time interval $[1, 2]$.

3. How do we interpret average velocity/speed geometrically on the graph of $y = p(t)$?

4. Find the instantaneous velocity of the particle at $t = 1$.

5. How do we interpret instantaneous velocity geometrically on the graph of $y = p(t)$?