1. In 1945, three cats were introduced to the small island of Aoshima off of the coast of Japan. In 1980, 20 cats lived on the island. In 1991, the cat population had grown to 33.

   (a) Suppose that the cat population is growing *exponentially*. Find an exponential formula for the population P of cats as a function of the number of years t **since 1981.**

   (b) Using your exponential model above, what is the projected population of cats on Aoshima in 2019?

   (c) Suppose that the population of cats is growing *linearly*. Find a formula for the population P as a function of the number of years t **since 1981.**

   (d) Using your linear model, what is the projected population of cats on Aoshima in 2019?

2. "*Zeke's Lemonade*" has cost and revenue functions (in dollars) given by:

$$C(q) = 3050 + 7.5q \qquad \textit{and} \qquad R(q) = 10q$$

where q represents the number of units of their product that are produced.

(a) Interpret the cost function $C(q) = 3050 + 7.5q$. What does 3050 mean? What does $7.5q$ mean?

(b) What is the profit P of *Zeke's Lemonade* given that q units are produced?

(c) What is the marginal profit for *Zeke's Lemonade*? Be sure to include units.

(d) How many units must *Zeke's Lemonade* produce in order to begin making a profit?

3. Consider the following functions.

$$f(x) = \sqrt{x} \qquad g(x) = (x+1)^2 \qquad h(x) = x^2 - 2x + 3$$

   (a) Compute the average rate of change of $f(x)$ from $x = 3$ to $x = 4$.

   (b) Compute the average rate of change of $g(x)$ from $x = -3$ to $x = -1$.

4. *Bank of GoGo* is offering a savings account with an interest rate of 2% compounded annually. How many years would it take for your savings to triple using this account?

5. Consider the following.

   (a) Assuming that $a > 0$, solve the following for x.

   $$\log_a(x-1) = 1 - \log_a(3x+1)$$

   (b) Solve the following for t.

   $$4^{2t-1} - 5^t = 0$$