Supplementary Handout

1. Suppose you eat a vitamin. Assume that the concentration v (in g/cm^3) of the vitamin at time t (in hours) in your body follows the model

$$v(t) = 0.002te^{-t}$$

   (a) How quickly is the concentration changing at 3 hours after taking the vitamin? Include units.

   (b) When does the concentration start decreasing?

2. Desalination is the process of turning salt water into fresh water. The amount of fresh water a machine can produce after t hours follows the model

$$F(t) = a + b\ln(t+1) \quad \text{gallons},$$

   where a and b are constants. Suppose that after one hour the machine can produce two gallons of fresh water.

   (a) Find the constants a and b in the model.

   (b) Find $F'(2)$ and interpret the result.

3. Do problem 2 again, but using the model $F(t) = a + b\log_2(t+1)$. Do you get the same result for $F'(2)$?

4. Compute $f'(x)$ for $f(x) = \log_{10}(x^2 + 1)$.

5. Compute $g'(x)$ for $g(x) = x^2 \cdot \ln(1 - x)$.