Week in Review # 3
Section 1.6, 1.7, and 1.8

Things to know:
- Know how to convert between the different bases of an exponential function.
- Know the difference between continuous and relative rate of growth/decay.
- Know how to simplify with logarithms.
- Know how to use logarithms to solve an exponential equation.
- Understand what the different growth terms mean: half-life, doubling time, ...
- Understand the terms present value and future value of a payment.
- Know how to shift and scale functions.
- Know how to compose functions.

1. Simplify with logarithm rules.
   (a) \( \ln (x^4 z^5) \)

   (b) \( \ln \left( \frac{e^{3x}}{x^5} \right) \)

2. Solve for x.
   (a) \( J = 5 \times 8^x \)

   (b) \( 8 \times 3^x = 2 \times 7^x \)
3. For each of these formulas
   I) Convert them into the form \( y = P_0a^t \) or \( y = P_0e^{kt} \)
   II) Give the relative rate of growth/decay.
   III) Give the continuous rate of growth/decay.

   (a) \( y = 35(1.25)^t \)

   (b) \( y = 27e^{-127t} \)

4. When solving for the yearly continuous rate of decay for a substance a student rounded
   the answer to two decimal places and got the answer of 2%.

   (a) If the correct rate of decay was 1.505%, find the half-life of the substance.

   (b) If the correct rate of decay was 2.4%, find the half-life of the substance.

   (c) How does the half-life of the student’s rate of decay compare with the answers in
       parts (a) and (b).
5. A bank account was started with $600. Two years later the account had $850.

(a) What is the continuous interest rate for the account?

(b) How long will it take for the account to triple?

6. You have been offered a payment of $5000 in 4 years and a payment of $8000 in 7 years. What is the present value of this offer if the interest rate is

(a) 6.25% compounded annually.

(b) 6.25% compounded continuously.
7. For the functions \( f(x) = \sqrt{x + 5} \) and \( g(x) = 2x^2 + 3 \) find

(a) \( g(f(7)) = \)

(b) \( f(g(2)) = \)

(c) \( g(3 + g(1)) = \)

(d) \( f(g(x)) = \)

(e) \( g(f(x)) = \)

8. Find two function \( f(x) \) and \( g(x) \) such that \( h(x) = f(g(x)) \)

\[ h(x) = 5 \ln(3x^2 + 1) \]
9. The graph of $f(x)$ is given. Use it to sketch the following.

(a) $f(x+3)$

(b) $f(x)+2$

(c) $-2f(x)$

(d) $2 - f(x)$