1. (A quick refresher from Monday.) Find the derivatives of the functions below.

   (a) $y = e^{2x} + \ln(2x)$

   (b) $y = e^2 + e^{\sin(cx)}$ where c is a constant.

   (c) $y = x^3 \sin(10^x)$

   (d) $w(r) = \ln(\tan^{-1}(r))$

   (e) $f(x) = x^{\ln(x)}$ Hint: Use logarithmic differentiation (which means to start by taking the natural log of both sides of the equation.)

2. For each of the functions: $f(x) = P_0 e^{kt}$, $f(x) = x^2$ and $f(x) = x^{10}$ write $f'(x)$ in terms of $f(x)$. Can you tell what $f^{(50)}$ is?

3. Chapter 4 is about applications of the derivative. Section 4.1 is about Related Rate Problems. *Example:* A 15-ft ladder is leaning against a wall. The top of the ladder slides down the wall. Assume that the ladder is rigid and does not shorten or lengthen as it slides. Draw a picture. Label with variables the lengths that are changing over time. Label with constants that things that are fixed. Which variables do you expect to have a positive derivative with respect to time? Negative? Zero? What equations can you think of that related some of the variables in your picture?

4. A list of derivative rules you will need to *know* how and when to use.

   (a) $\frac{d}{dx}[f(x)g(x)] =$

   (b) $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] =$

   (c) $\frac{d}{dx}[f(g(x))] =$

   (d) $\frac{d}{dx}[\sin(x)] =$

   (e) $\frac{d}{dx}[\cos(x)] =$

   (f) $\frac{d}{dx}[\tan(x)] =$

   (g) $\frac{d}{dx}[\sec(x)] =$

   (h) $\frac{d}{dx}[\cot(x)] =$

   (i) $\frac{d}{dx}[\csc(x)] =$

   (j) $\frac{d}{dx}\left[\sin^{-1}(x)\right] =$

   (k) $\frac{d}{dx}\left[\cos^{-1}(x)\right] =$

   (l) $\frac{d}{dx}\left[\tan^{-1}(x)\right] =$

   (m) $\frac{d}{dx}[e^x] =$

   (n) $\frac{d}{dx}[a^x] =$

   (o) $\frac{d}{dx}[\ln(x)] =$

   (p) $\frac{d}{dx}[\log_a(x)] =$