Reworking yesterday

1. What is our definition of the constant, e, which often appears in exponential functions?

2. Use a difference quotient [yes, the equation on your *PostIt*] to show that when $f_b(x) = b^x$,
$$f_b'(x) = k_b \cdot b^x$$
where k_b is some constant that depends on b.

Thinking about functions

3. Even and Odd Functions

   (a) $y = x^2$ is an example of an *even function* because it has a nice geometric symmetry. Describe this symmetry.

   (b) $y = x^3$ is an example of an *odd function.* It has a different geometric symmetry. Describe this symmetry.

   (c) Algebraically, we define $E(x)$ to be an *even* function if $E(-x) = E(x)$ for all values of x in the domain of E. Using this example, give an algebraic definition of an *odd* function, $O(x)$.

4. Recall the limit rules (e.g. *the limit of a product is the product of the limits*). In English, write the proposed derivative rule, and use a difference quotient [see your bathroom mirror] to show:

   (a) If k is a constant and $g(x) = kf(x)$ then $g'(x) = kf'(x)$.

   (b) If $s(x) = f(x) + g(x)$ then $s'(x) = f'(x) + g'(x)$

5. Suppose $E(x)$ is an even function, $O(x)$ is an odd function, and $f(x)$ is any function. Explore these composition functions and determine if they *always* have some symmetry.
   • If you think the answer is *yes*, use the algebraic definitions to prove your conjecture.
   • If you think the answer is *no*, show a counter-example.

   (a) $E \circ O(x)$

   (b) $f \circ E(x)$