

Worksheet #7 - Composition

February 6, 2006

Composition Problems: Breakdown the following functions into the composition of two functions. One trick is to think about how your calculator to evaluate the function - but now think how you could break the process into two steps.

$$A(x) = (x^5 + 3x + 17)^8$$

$$B(x) = 17^{x^2 - 5x}$$

$$C(x) = 40e^{-5x}$$

$$D(x) = \ln(3x^2 + 10)$$

Approximations: Polynomials and exponentials have different properties. At a local level, they sometimes behave in a very similar manner. We've seen some applications of where exponentials are used, but evaluating an exponential function often requires a calculator (such as $2^{1.76}$ or $e^{2.5}$). Polynomials are easier to evaluate because they only require multiplication and addition. Follow the steps to see how a polynomial can be used to approximate an exponential function.

- What does it mean if two functions equal to each other? Are two functions equal to each other if they intersect each other? What does it mean to say $f(x)$ approximates $g(x)$?
- Input the following functions into your calculator.

$$y = e^{3x}$$

$$y = 1 + 3x + 4.5x^2$$

- Use the following windows to see what is happening to the functions as you zoom in on the graphs. For each window setting, graph the functions.

$$[Xmin, Xmax] = [-5, 5] \quad [Ymin, Ymax] = [-5, 50]$$

$$[Xmin, Xmax] = [-1, 1] \quad [Ymin, Ymax] = [0, 5]$$

$$[Xmin, Xmax] = [-0.4, 0.4] \quad [Ymin, Ymax] = [0, 3]$$

- Are these functions equal to each other everywhere?
- Near $x = 0$, what properties do these functions have in common? There are three properties that they have in common.