ESP Math 179 **Spring 2016**

Worksheet 8

4 February 2016

Recall the following rules for differentiating, for any real number c:

$$\frac{d}{dx}(c \cdot f(x)) = c \cdot \frac{d}{dx}(f(x)) \qquad \frac{d}{dx}(x^c) = cx^{c-1}$$

$$\frac{d}{dx}(f(x) + g(x)) = \frac{d}{dx}(f(x)) + \frac{d}{dx}(g(x)) \qquad \frac{d}{dx}(c^x) = \ln(c)c^x$$

1. **Warm up:** Answer these questions with "True" or "False".

   (a) If a line is tangent to a graph at a point, it only touces the graph at that point.

   (b) The exponential function e^x has two different points with equal tangent lines.

   (c) Given any line, there is always a function with that line as a tangent line at $x = 0$.

2. Evaluate derivatives of the following functions, with respect to x.

   (a) x^5

   (b) $x^{5/2}$

   (c) $x^{5/2}/x^{3/2}$

   (d) x^{-5}

   (e) $x^5 + x^{-5}$

   (f) $2x^5$

   (g) $(2x^5) \cdot (3x^{5/2})$

   (h) $-2(x^5 + 3x^{-5/2})$

   (i) $2 \cdot \dfrac{x^{-3/2} - x^5}{5x}$

   (j) e^x

   (k) e^{5x}

   (l) $e^{5x}e^{5x/2}$

   (m) 5^x

   (n) $e \cdot e^{ex}$

   (o) $e^{5x}/5^{ex}$

3. Consider the function e^x and a point a on the x-axis.

   (a) Find the equation of the tangent line, in the form $y = mx + b$, of e^x at $x = a$.

   (b) Find $\lim_{a \to -\infty} [m]$.

4. Using the limit definition of the derivative, show that the derivative of a sum of two functions is the sum of the derivatives of the two functions.

5. Think of the topic in Math 180 at which you feel weakest.

   (a) Write down a question in this topic that you could not answer.

   (b) Write down a question in this topic that you could answer.