Calculus I **Fall 2014**

Even more derivatives and some review

Discussion session 8 - 18 September 2014

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1. Let $h(x) = e^x \cos(x)$.

   (a) What is the 293rd derivative of h?

   (b) Give a general formula for the nth derivative of h (you may have to split it up into several cases).

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2. Evaluate the following limits, if they exist.

   (a) $\lim_{x \to 0} \left[\dfrac{\sin(|x|)}{x} \right]$

   (b) $\lim_{x \to 0} \left[\dfrac{\sin(x)}{\tan(3x)} \right]$

3. Suppose that a function g for $x \in [0, 1]$ is described by

$$\sin(\pi x) \leqslant g(x) \leqslant \frac{1}{4x(1-x)}.$$

(a) What can you say about $\lim_{x \to 1} [g(x)]$? Evaluate it if it exists.

(b) Is $g(x)$ continuous at $x = 1$?

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4. Find all points (x, y) on the graph of $f(x) = \dfrac{x-1}{2-x}$ where the tangent lines are perpendicular to the line $8x + 2y = 1$.

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5. Let $k(x) = x^3 - 2x^2 - 25x + 50$.

(a) Find an x-value where $k(x)$ is positive, and an x-value where $k(x)$ is negative.

(b) Use the intermediate value theorem to show that $k(x)$ has exactly three roots.