ESP Math 179 **Fall 2015**

Worksheet 3

1 September 2015

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1. **Warm up:** Let $f(x)$ be a function with $f(1) = 10$ and $f(2) = -2$, and $h(x) = f(x+1)$. Evaluate the following expressions:

   (a) $h(0)$

   (b) $h(1)/2$

   (c) $f\left(\sqrt{\ln(e^4)}\right)$

   (d) $f(h(f(2)+3)+3)+3$

2. Evaluate the following limits, if they exist.

   (a) $\lim_{x\to 0}[\ln(x+1)]$

   (b) $\lim_{x\to 1}\left[\dfrac{x^2-1}{x-1}\right]$

   (c) $\lim_{y\to 4}\left[\dfrac{y^2-y-12}{\sqrt{y}-2}\right]$

   (d) $\lim_{z\to 3}\left[\dfrac{3-z}{z-3}\right]$

   (e) $\lim_{w\to 3}\left[\dfrac{|w-3|+|w-3|}{w-3}\right]$

3. Consider the following function:

$$f(x) = \begin{cases} 2x^3 & \text{if } x \leqslant -1, \\ ax+b & \text{if } -1 < x < 1, \\ |x| & \text{if } x \geqslant 1. \end{cases}$$

   (a) Find a pair of real numbers a, b that make the function f continuous.

   (b) With the pair you found in part (a), graph f on a grid.

   (c) For any real number r, what is $\lim_{x\to r}[f(x)]$ equal to? In other words, how can you simplify this given limit expression?

4. Let $f(x) = \sin(1/x)$.

   (a) What is the domain of f?

   (b) What is the range of f?

   (c) What is $\lim_{x\to\infty}[f(x)]$, if it exists?

   (d) What is $\lim_{x\to 0}[f(x)]$, if it exists?

   (e) Graph $f(x)$.