Worksheet 4

21 January 2016

1. **Warm up:** Fill in the blank to the following questions with one of the answers *0, 1, 2, finitely many*, or *infinitely many*.

   (a) A function can have at most _____ vertical asymptotes.

   (b) A function can have at most _____ horizontal asymptotes.

   (c) A function can have at most _____ zeros.

2. Draw the graphs of the following important functions. Make sure to label your axes.

$$f(x) = \sin(x)$$
$$g(x) = \cos(x)$$
$$h(x) = e^x$$
$$k(x) = \ln(x)$$
$$\ell(x) = 1/e^x$$
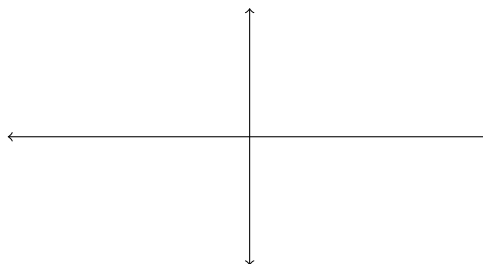
3. Find the following limits, if they exist.

   (a) $\lim\limits_{x \to 0} \left[\dfrac{1}{x^2} \right]$

   (c) $\lim\limits_{t \to 2} \left[\dfrac{t-2}{|t-2|} \right]$

   (e) $\lim\limits_{x \to 0} \left[\dfrac{e^x + 1}{e^{2x} - 1} \right]$

   (b) $\lim\limits_{x \to 0} \left[\dfrac{1}{x^3} \right]$

   (d) $\lim\limits_{w \to 0} \left[\cos(w)|w|/w \right]$

   (f) $\lim\limits_{t \to 16} \left[\dfrac{\sqrt{t} - \frac{t}{4}}{t - 16} + \dfrac{1}{4} \right]$

4. Find constants k such that the following limits exist.

   (a) $\lim\limits_{x \to 5} \left[\dfrac{x}{x-k} \right]$

   (d) $\lim\limits_{z \to -10} \left[\sqrt{\ln(z+k)} \right]$

   (b) $\lim\limits_{y \to \pi} \left[\csc(2y)\sin(ky) \right]$

   (e) $\lim\limits_{x \to 0} \left[\dfrac{k}{x} - \dfrac{4}{kx} \right]$

   (c) $\lim\limits_{x \to 1} \left[\dfrac{x^2 - k}{x - 1} \right]$

   (f) $\lim\limits_{t \to 3} \left[\dfrac{4t^2 + kt + 7k - 6}{2t^2 - 5t - 3} \right]$