Math 1000 – Dalhousie University – Summer 2010

Assignment 1 – Due Wednesday July 7th

1. Guess the value of $\lim_{x\to 2} \dfrac{x^2+x-6}{x-2}$ by taking x closer and closer (from each side) to 2.

2. From the graph of $f(x)$, determine the following (indicate if a limit is infinite/nonexistent):

   (a) $\lim_{x\to -2^-} f(x)$

   (b) $\lim_{x\to -2^+} f(x)$

   (c) $\lim_{x\to 0} f(x)$

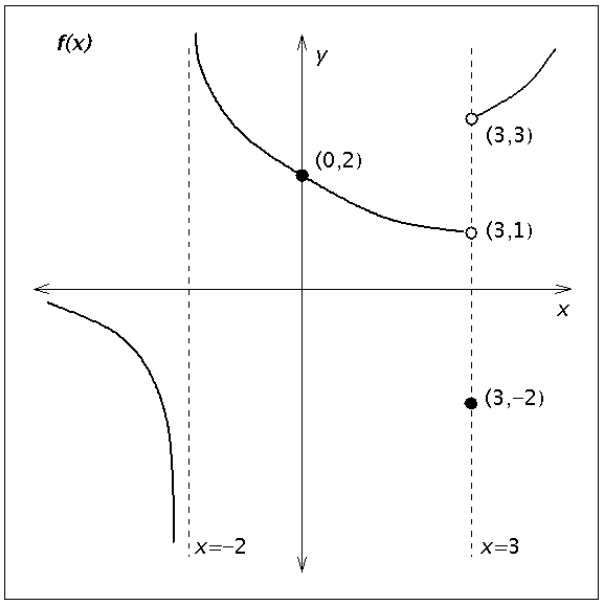
   (d) $\lim_{x\to 3^-} f(x)$

   (e) $\lim_{x\to 3^+} f(x)$

   (f) $\lim_{x\to 3} f(x)$

   (g) $f(0)$

   (h) $f(3)$



3. Determine the following infinite limits:

   (a) $\lim_{x\to -3^-} \dfrac{x+5}{x+3}$

   (b) $\lim_{\theta\to \pi^-} \csc\theta$

4. A *piecewise function* is one whose definition is different on different parts of the domain (e.g., $f(x)$ in q.2). Given the piecewise function $g(x)$, determine the one-sided limits:

$$g(x) = \begin{cases} (x+2)^2, & \text{if } x < 1 \\ \sqrt{x-1}+1, & \text{if } x \geq 1 \end{cases}$$

   (a) $\lim_{x\to 1^-} g(x)$

   (b) $\lim_{x\to 1^+} g(x)$

5. Explain why statement (a) below is incorrect while statement (b) is valid.

   (a) $\dfrac{(x-1)(x+2)}{x-1} = x+2$

   (b) $\lim_{x\to 1} \dfrac{(x-1)(x+2)}{x-1} = \lim_{x\to 1} x+2$

6. Evaluate each of the following limits and **show your workings**:

   (a) $\lim_{h\to 0} \dfrac{(1+h)^3-1}{h}$

   (b) $\lim_{x\to -1} \dfrac{x^2+3x+2}{x^4-1}$

   (c) $\lim_{x\to 3} \dfrac{\frac{1}{3}-\frac{1}{x}}{x-3}$

   (d) $\lim_{t\to 9} \dfrac{t-9}{3-\sqrt{t}}$

   (e) $\lim_{\theta\to 0} \sqrt{\theta}\sin\left(\dfrac{\pi}{\theta}\right)$ (Use the Squeeze Theorem and an inequality you know for $\sin x$.)