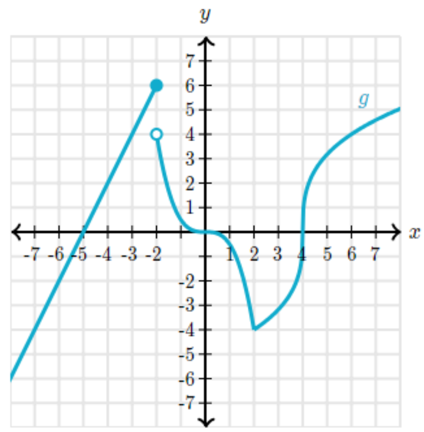
Math 19: Quiz 1 Solutions Name:

For full credit you must show your work. Partial credit may be given for incorrect solutions if sufficient work is shown.

1. The function $g(x)$ is graphed below.



- $\lim_{x\to -2^-} g(x) = 6$
- $\lim_{x\to -2^+} g(x) = 4$
- $\lim_{x\to -2} g(x) =$ DNE
- $g(-2) = 6$

2. Suppose $\lim_{x\to 2} f(x) = 8$. Evaluate the following limit.

$$\lim_{x\to 2}\left(\frac{f(x)}{x} - \frac{x^2-4}{x-2}\right).$$

We can rewrite the limit of the sum (difference) of two functions into the sum (difference) of two limits.

$$\lim_{x\to 2}\left(\frac{f(x)}{x} - \frac{x^2-4}{x-2}\right) = \lim_{x\to 2}\frac{f(x)}{x} - \lim_{x\to 2}\frac{x^2-4}{x-2}.$$

The denominator of the first term is nonzero when $x = 2$ so

$$\lim_{x\to 2}\frac{f(x)}{x} = \frac{\lim_{x\to 2} f(x)}{\lim_{x\to 2} x} = \frac{8}{2} = 4.$$

For the second term, when $x = 2$ we have

$$\lim_{x\to 2}\frac{x^2-4}{x-2} = \frac{0}{0}$$

which means we need to factor! We can factor the numerator,

$$\lim_{x \to 2} \frac{x^2 - 4}{x - 2} = \lim_{x \to 2} \frac{(x+2)(x-2)}{x-2} = \lim_{x \to 2} x + 2 = 4.$$

Finally, putting the two limits together

$$\lim_{x \to 2} \left(\frac{f(x)}{x} - \frac{x^2 - 4}{x - 2} \right) = 4 - 4 = 0.$$