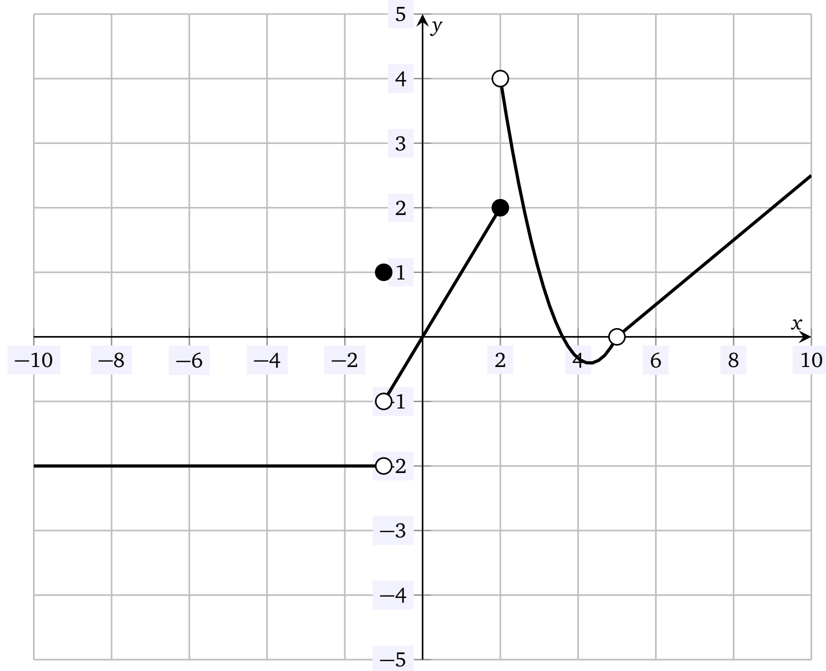
Name: *Caleb McWhorter — Solutions* **Quiz 9**

MAT 295 **Fall 2016**



Problem 1: Use the plot of $f(x)$ above to answer the following questions:

(a) $\lim_{x\to 5^+} f(x) = 0$

(b) $\lim_{x\to 5^-} f(x) = 0$

(c) $\lim_{x\to 5} f(x) = 0$

(d) $f(5) = \textit{undef.}$

(e) $\lim_{x\to 2^+} f(x) = 4$

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

(g) $\lim_{x\to 2} f(x) = \textit{DNE}$

(h) $f(2) = 2$

(i) $\lim_{x\to -1^+} f(x) = -1$

(j) $\lim_{x\to -1^-} f(x) = -2$

(k) $\lim_{x\to -1} f(x) = \textit{DNE}$

(l) $f(-1) = 1$

Problem 2: Evaluate the following limits (you may *not* use l'Hôpital's Rule):

$$\lim_{x\to 0} \frac{x}{\sqrt{x+4}-2} = \lim_{x\to 0} \frac{x}{\sqrt{x+4}-2} \cdot \frac{-\sqrt{x+4}-2}{-\sqrt{x+4}-2} = \lim_{x\to 0} \frac{x(-\sqrt{x+4}-2)}{-(x+4)+4} = \lim_{x\to 0}(\sqrt{x+4}+2) = 4$$

$$\lim_{x\to -3} \frac{x^2+x-6}{x^2-2x-15} = \lim_{x\to -3} \frac{(x+3)(x-2)}{(x+3)(x-5)} = \lim_{x\to -3} \frac{x-2}{x-5} = \frac{5}{8}$$

$$\lim_{x\to 0} \frac{\tan(5x)}{x} = \lim_{x\to 0} \frac{\sin 5x}{x\cos 5x} = \lim_{x\to 0}\left(\frac{\sin 5x}{5x} \cdot \frac{1}{\cos 5x} \cdot 5\right) = 1 \cdot 1 \cdot 5 = 5$$

Problem 3: Evaluate the limit $\lim_{x\to 0} \frac{\frac{1}{x+2} - \frac{1}{2}}{x}$. Recognize the limit as the derivative of a particular function and check your answer using differentiation.

$$\lim_{x\to 0} \frac{\frac{1}{x+2} - \frac{1}{2}}{x} = \lim_{x\to 0} \frac{\frac{2-(x+2)}{2(x+2)}}{x} = \lim_{x\to 0} \frac{-x}{x(2(x+2))} = \lim_{x\to 0} \frac{-1}{2(x+2)} = -\frac{1}{4}$$

Note that this limit is exactly $\frac{d}{dx}\left(\frac{1}{x}\right)\Big|_{x=2} = \frac{-1}{x^2}\Big|_{x=2} = -\frac{1}{4}$.