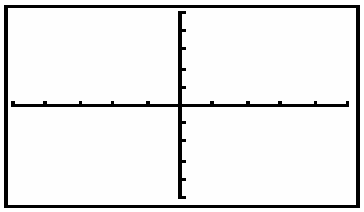
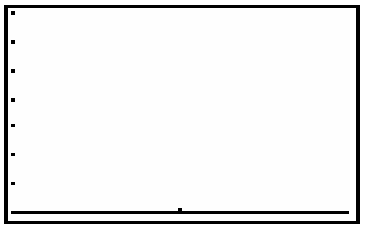
Assignment 6: Limits, Part II (1.5) **Name**_____
Please provide a handwritten response.

1. We can use the calculators to conjecture limits even when the answer is $\pm\infty$. Even though $\lim_{x\to 0}\frac{1}{x}$ does not exist, it is nonetheless true that $\lim_{x\to 0^+}\frac{1}{x}=\infty$ and that $\lim_{x\to 0^-}\frac{1}{x}=-\infty$. Graph $y=\frac{1}{x}$ below. Does your calculator support the result?



$-5 \le x \le 5, -5 \le y \le 5$

2a. Find the value of $\lim_{x\to 2^+}\frac{4-x}{(x-2)^2}$ by hand. Graph the function on the axes provided to see the graph near $x=2$.

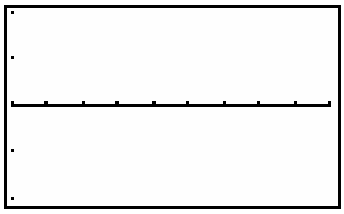


$1.5 \le x \le 2.5, 0 \le y \le 14000$

2b. Based on this graph, what do you think $\lim_{x\to 2^+}\frac{4-x}{(x-2)^2}$ is?

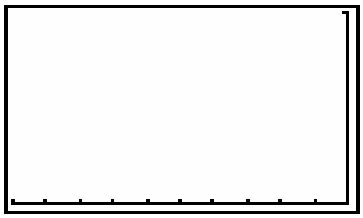
2c. Based on this graph, do you think that $\lim_{x\to 2}\frac{4-x}{(x-2)^2}$ exists? If so, then what is its value?

3. You can also use the calculator to conjecture limits when $x\to\infty$ or $x\to-\infty$ by examining the end behavior of the graph of the function. For example, conjecture $\lim_{x\to\infty}\frac{5x-7}{4x+3}$ and record the graph below. Trace to the right and hold the arrow key down to form your conjecture. Record the conjecture below. Is this answer correct?



$1000000 \le x \le 10000000, -2 \le y \le 2$

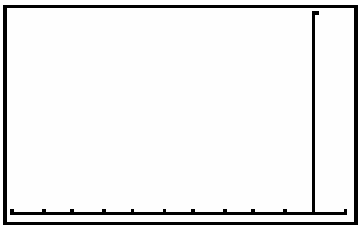
4a. Find the value of $\lim_{x \to -\infty} \frac{x + \cos x}{3x + 2}$. Sketch the graph of $y = \frac{x + \cos x}{3x + 2}$ below.



$-10 \le x \le 0, 0 \le y \le 1$

4b. Based on this graph, how accurately can you tell the value of $\lim_{x \to -\infty} \frac{x + \cos x}{3x + 2}$? What do you think it is?

4c. Now sketch the graph on the axes below. Can you now be more specific about the value of $\lim_{x \to -\infty} \frac{x + \cos x}{3x + 2}$? Why was the graph in part **a** so much smoother than this one?



$-100 \le x \le 10, 0 \le y \le 1$

4d. Trace to the left and hold the arrow key down and let the screen move. What do you think the limit is now? Is this result surprising?