

Assignment 6: Limits, Part II (1.4)**Name:** _____**Please provide a handwritten response.**

1a. The `lim` command can also be used to find limits even when the answer is $\pm \infty$. For example, although $\lim_{x \rightarrow 0} \frac{1}{x}$ does not exist, it is true that $\lim_{x \rightarrow 0^+} \frac{1}{x} = \infty$ and $\lim_{x \rightarrow 0^-} \frac{1}{x} = -\infty$.

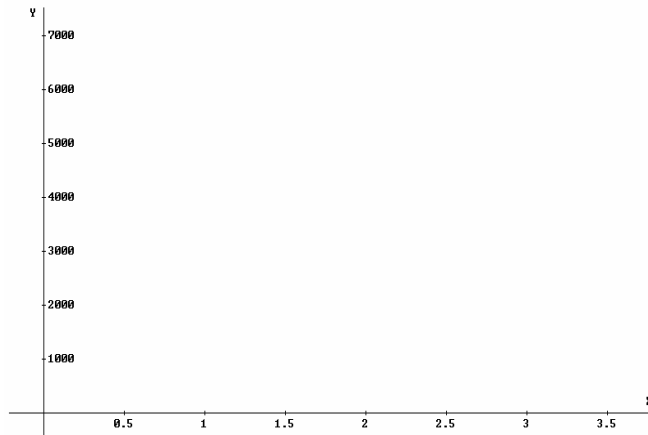
Author `1/x` and use *Derive* to find $\lim_{x \rightarrow 0^+} \frac{1}{x}$. Record the result below; is *Derive* correct?

1b. Likewise, use *Derive* to find $\lim_{x \rightarrow 0^-} \frac{1}{x}$. Record the result below. Is it correct?

2a. Suppose we want to find

$\lim_{x \rightarrow 2} \frac{4-x}{(x-2)^2}$. First, **Author**

$(4-x)/(x-2)^2$ and plot the function. Zoom to an appropriate view then sketch the result on the axes at right.




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

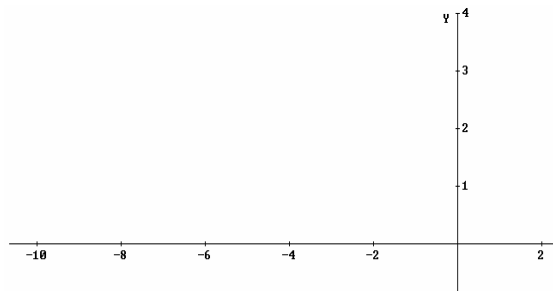
2c. Based on this graph, do you think $\lim_{x \rightarrow 2} \frac{4-x}{(x-2)^2}$ exists? If so, what is its value?

2d. Use `lim` to find the limit and record the result below. Does *Derive*'s result appear to be correct?



3a. *Derive* can also find limits as $x \rightarrow \infty$ or $x \rightarrow -\infty$; in this case we refer to ∞ as **inf**. For example, to find $\lim_{x \rightarrow \infty} \frac{5x-7}{4x+3}$, we **Author** $(5x-7)/(4x+3)$ then click **lim**. Specify x as the variable and **inf** as the limit point. Click **OK** then simplify the result. Record the result below. Is this answer correct?

3b. Calculate the limit in 3a again, but ask *Derive* to approach ∞ from the right. Is this possible? (Think about it!) Record *Derive*'s result.

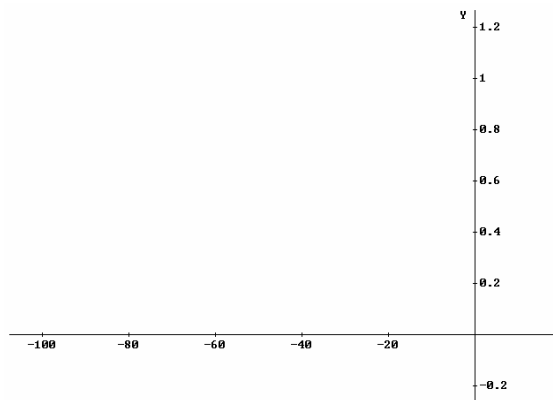
4a. Now examine $\lim_{x \rightarrow -\infty} \frac{x + \cos(x)}{3x + 2}$. First, plot the function, then zoom in and out with  to adjust the ranges appropriately and sketch the result on the axes at right.



4b. Based on this graph, how accurately can we tell the value of $\lim_{x \rightarrow -\infty} \frac{x + \cos(x)}{3x + 2}$? Record the estimate below.

4c. Zoom out further on the x -axis by clicking . Notice how the range increases on the x -axis but not the y -axis. Click  to zoom in on the x -axis. Choose an appropriate range and sketch the result on the axes at right. Can we now find

$\lim_{x \rightarrow -\infty} \frac{x + \cos(x)}{3x + 2}$? Record the result below.



4d. Try using **lim** with a limit point of **-inf** to find the limit. Record the result below.

4e. Use *Derive* to calculate $\lim_{x \rightarrow -\infty} \frac{x^{3/2} + \sin(x)}{x^2 + 4}$ and record the result below. (Enter the function very carefully; be sure it looks like the one given here!)