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

1a. The `limit` command can be used even when the answer is $\pm\infty$. The $\lim\limits_{x \to 0} \dfrac{1}{x}$ does not

exist, it is nonetheless true that $\lim\limits_{x \to 0^+} \dfrac{1}{x} = \infty$ and that $\lim\limits_{x \to 0^-} \dfrac{1}{x} = -\infty$. Execute the command

`limit(1/x,x=0,right);` to find $\lim\limits_{x \to 0^+} \dfrac{1}{x}$ and record the result below. Is *Maple*'s

result correct?

1b. Likewise execute the command `limit(1/x,x=0,left);` to find $\lim\limits_{x \to 0^-} \dfrac{1}{x}$ and

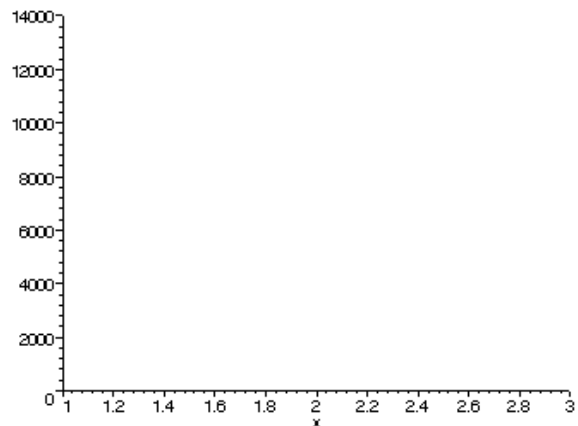record the result below. Is *Maple*'s result again correct?

2a. To evaluate $\lim\limits_{x \to 2^+} \dfrac{4-x}{(x-2)^2}$ first execute the

command

    f:=x->(4-x)/(x-2)^2;

and then the command

    plot(f(x),x=1..3,0..14000);

to see the graph near $x = 2$. Sketch the result
on the axes at right.

2b. Based on this graph, what do you think is

the value of $\lim\limits_{x \to 2^+} \dfrac{4-x}{(x-2)^2}$?

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

value?

2d. Execute the command `limit(f(x),x=2,right);` to find $\lim\limits_{x \to 2^+} \dfrac{4-x}{(x-2)^2}$, and

record the result below. Does *Maple*'s result appear to be correct?

3. The `limit` command can also be used when $x \to \infty$ or $x \to -\infty$; in this case we refer to ∞ as `infinity`. For example, execute the command

$$\texttt{limit((5*x-7)/(4*x+3),x=infinity);}$$

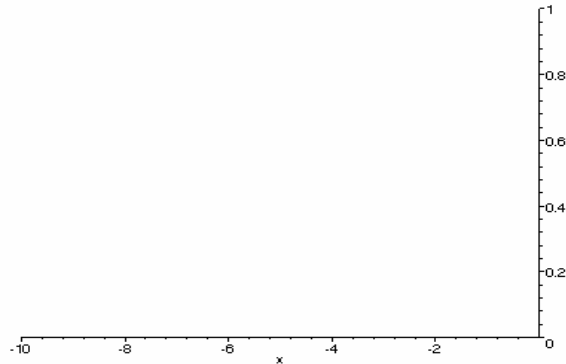and record the result below. Is this answer correct?

4a. To calculate the $\lim\limits_{x \to -\infty} \dfrac{x + \cos x}{3x + 2}$ first execute the command

```
g:=x->(x+cos(x))/(3*x+2);
```

and then the command

```
plot(g(x),x=-10..0,0..1,
     discont=true);
```

to see how the graph looks when x is large and negative. Sketch the result on the axes at right.

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

4c. Zoom out further by executing

```
plot(g(x),x=-100..10,0..1,
     discont=true);
```

Sketch the result on the axes at right. Can you now be more specific about the value of $\lim\limits_{x \to -\infty} \dfrac{x + \cos x}{3x + 2}$? Why was the graph in part **a** so much smoother than this one?
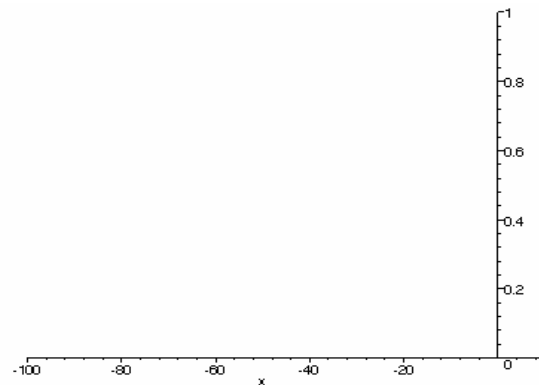
4d. Try executing `limit(g(x),x=-infinity);` to find our limit; is the result surprising?