

# Section 2.2

## Solutions and Hints

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**for the book:**  
**Calculus, Early Vectors**  
by James Stewart.

17. Calculate the given limit:

$$\lim_{x \rightarrow 5^+} \frac{6}{x-5}$$

As presented in this chapter you need to think about this.  
Consider the values of  $x$  as it approaches 5 from the right, along with the values of  $(x - 5)$  and  $6 / (x - 5)$ . Making tables will usually help (notice some calculators will do such tables for you using their list functions).

<b>x</b>	<b>x - 5</b>	<b>6 / (x - 5)</b>
10	5	1.2
7	2	3
6	1	6
5.5	0.5	12
5.1	0.1	60
5.01	0.01	600
5.001	0.001	6000
5.0001	0.0001	60 000

The denominator  $(x - 5)$  gets smaller and smaller but always stays POSITIVE.  
The numerator stays constant.  
The function  $6 / (x - 5)$  gets bigger and bigger.

Thus we conclude:

$$\lim_{x \rightarrow 5^+} \frac{6}{x-5} = +\infty$$

18. Calculate:  $\lim_{x \rightarrow 5^-} \frac{6}{x-5}$

This is the same as 17 but x approaches 5 from the LEFT and that changes stuff.

x	x - 5	6 / (x - 5)
0	-5	-1.2
3	-2	-3
4	-1	-6
4.5	-0.5	-12
4.9	-0.1	-60
4.99	-0.001	-600
4.999	-0.0001	-6000
4.9999	-0.00001	-60 000

The denominator (x - 5) gets smaller and smaller but always stays NEGATIVE.

The numerator stays constant.

The function 6 / (x - 5) gets bigger and bigger → but is NEGATIVE.

Thus we conclude:

$$\lim_{x \rightarrow 5^-} \frac{6}{x-5} = -\infty$$

21. Calculate:  $\lim_{x \rightarrow -2^+} \frac{x-1}{x^2(x+2)}$

Again you can make a table and figure this out. You might also think:

Okay, -1.9 is almost -2 and is on the “right” side of 2...

The numerator is negative and “big” ( absolute value > 1)

The denominator is positive and (-1.9 + 2) = 0.1 is “small” ( absolute value < 1 )

As x gets closer to -2 the numerator stays “big” and negative, while the denominator gets smaller and smaller and stays positive.

So we have a “big” negative divided by a small positive.

Big divided by small → infinity

Negative divided by positive → negative

So we conclude:

$$\lim_{x \rightarrow -2^+} \frac{x-1}{x^2(x+2)} = -\infty$$