

Homework Set 15

Calculating Limits using the Chart Method

(sections 1.3 & 1.6)

Calculate each of the following limits, $\lim_{x \rightarrow a} f(x)$, by picking values for x which approach a and computing the associated $f(x)$ values. If values for x are given, use them. If no values for x are given, choose your own numbers. Then use the created chart to find the limit of the function.

1.

$$\lim_{x \rightarrow 0} \frac{\sin x}{2x + \tan x} \quad \text{use } x = \pm 1, \pm 0.5, \pm 0.1, \pm 0.01, \pm 0.001$$

$$= \frac{1}{3}$$

check:

$$\begin{aligned} \lim_{x \rightarrow 0} \frac{\sin x}{2x + \tan x} &= \lim_{x \rightarrow 0} \frac{\cos x}{2 + \sec^2 x} \\ &= \frac{1}{2+1} = \frac{1}{3} \end{aligned}$$

X	$\frac{\sin x}{2x + \tan x}$
-1	.23654
-.5	.31005
-.1	.33241
-.01	.33332
-.001	.33333
.001	.33333
.01	.33332
.1	.33241
.5	.31005
1	.23654

2.

$$\lim_{x \rightarrow -6} \frac{2x + 12}{|x + 6|}$$

$$= \text{DNE}$$

check:

$$\frac{2x+12}{|x+6|} = \frac{2(x+6)}{|x+6|} = \begin{cases} -2, & x < -6 \\ 2, & x > -6 \end{cases}$$

X	$\frac{2x+12}{ x+6 }$
-7	-2
-6.5	-2
-6.1	-2
-6.01	-2
-5.99	2
-5.9	2
-5.5	2
-5	2

3.

$$\lim_{x \rightarrow 1^-} \frac{1}{x^3 - 1} = -\infty$$

X	$\frac{1}{x^3 - 1}$
0	-1
.5	-1.143
.9	-3.69
.99	-33.67
.999	-333.7

4.

$$\lim_{x \rightarrow 0^+} \left(\frac{1}{x} - \frac{1}{|x|} \right) = DNE$$

$$\text{here } \lim_{x \rightarrow 0^+} \left(\frac{1}{x} - \frac{1}{|x|} \right) = 0$$

$$\lim_{x \rightarrow 0^-} \left(\frac{1}{x} - \frac{1}{|x|} \right) = -\infty$$

X	$\frac{1}{x} - \frac{1}{ x }$
1	0
.5	0
.1	0
.01	0
.001	0
-0.001	-2000
-0.01	-200
-0.1	-20
-0.5	-4
-1	-2

5.

$$\lim_{x \rightarrow \infty} \frac{x^2}{2^x} = 0$$

check:

$$\begin{aligned} \lim_{x \rightarrow \infty} \frac{x^2}{2^x} &= \lim_{x \rightarrow \infty} \frac{2x}{2^x \ln 2} \\ &= \lim_{x \rightarrow \infty} \frac{2}{2^x (\ln 2)^2} \\ &= 0 \end{aligned}$$

X	$\frac{x^2}{2^x}$
1	.5
10	.09766
20	.00038
30	.00000084