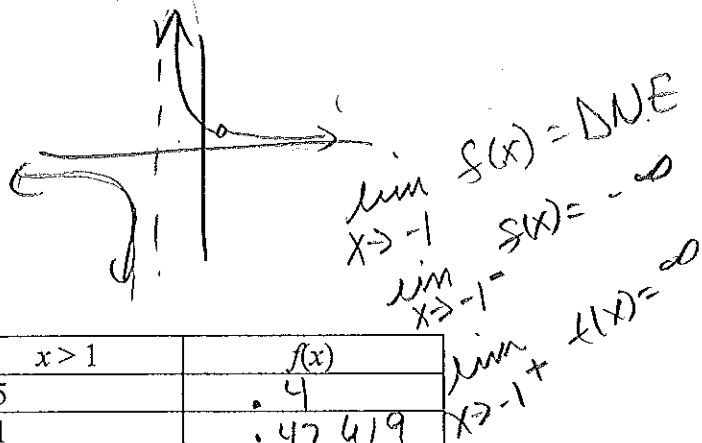## Section 2.2 The Limit of a Function Notes

The limit of a function: the limit of $f(x)$, as x approaches a, equals L written as

$$\lim_{x \to a} f(x) = L$$

Example 1: Estimate the value of $\displaystyle \lim_{x \to 1} \frac{x-1}{x^2-1}$

Look at values of x both less and greater than 1.

(handwritten, right margin) $\lim_{x \to -1} f(x) = DNE$
$\lim_{x \to -1^-} f(x) = -\infty$
$\lim_{x \to -1^+} f(x) = \infty$

$x < 1$	$f(x)$
0.5	.6
0.9	.5263
0.99	.50251
0.999	.50025
0.9999	.50003

$x > 1$	$f(x)$
1.5	.4
1.1	.47419
1.01	.49751
1.001	.49975
1.0001	.49998

This limit appears to be __½__ the closer we get to $\underline{x = 1}$. The key is, the limit must be the __same__ on both sides of the number otherwise the limit does not exist. (__DNE__)

Left hand limit: the limit as x approaches a from the left side of a. $\displaystyle \lim_{x \to a^-} f(x) = L$

Right hand limit: the limit as x approaches a from the right side of a. $\displaystyle \lim_{x \to a^+} f(x) = L$
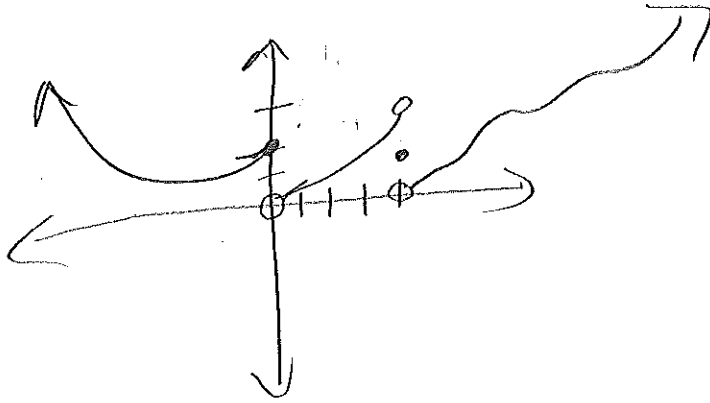
Limit: $\displaystyle \lim_{x \to a} f(x) = L$

if and only if

$$\lim_{x \to a^-} f(x) = L \quad \text{and} \quad \lim_{x \to a^+} f(x) = L.$$

Guided practice: Page 102 #5 and #16.

Answers: 5a) -1 b) -2 c) DNE

d) 2 e) 0 f) DNE

g) 1 h) 3

#16

Homework: page 102 #1-4, 6, 7, 12, 13-15, 17, 21, 22, 28)