

MA 181 SECTION 2.2 THE LIMIT OF A FUNCTION

1. Consider the function $f(x) = \frac{x^2 + x - 12}{(x - 3)}$

- A. What kind of function is f ? Why?
- B. Obviously, $f(3)$ is undefined. Why?
- C. Is f defined for values of near 3?

x	f(x)	x	f(x)
2.9		3.1	
2.99		3.01	
2.999		3.001	
2.9999		3.0001	
2.99999		3.00001	

- D. As x gets close to 3, what does the value of $f(x)$ get close to?
- E. Look at graph in enlarged decimal window $[-4.7, 4.7]$ by $[-3.1, 9.3]$ and trace to hole in graph.
- F. $f(3)$ is not defined, but $\lim_{x \rightarrow 3} f(x)$ exists.
- G. Note definitions (1) page 95 and (3) page 100.
- H. We say $\lim_{x \rightarrow 3} f(x) = 7$. In plain speak, that means as x gets close to 3, $f(x)$ gets close to 7. You tell me how close to 7 you want to be, say $|f(x) - 7| \leq 0.001$, then I can find an interval about $x = 3$, for which this is true. That is, $2.999 \leq x \leq 3.001$. Examine $f(x)$ on $[2.999, 3.001]$ by $[6.999, 7.001]$

2. ONE-SIDED LIMITS

$$f(x) = \begin{cases} 2 - x & \text{if } x < -1 \\ x & \text{if } -1 \leq x \leq 1 \\ (x - 1)^2 & \text{if } x > 1 \end{cases}$$

- A. For what values of a does $\lim_{x \rightarrow a} f(x)$ exist?
- B. List the one-sided limits of $f(x)$.

$$\lim_{x \rightarrow -1^-} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow -1^+} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow 1^-} f(x) = \underline{\hspace{2cm}}$$

$$\lim_{x \rightarrow 1^+} f(x) = \underline{\hspace{2cm}}$$

