1.2 Notes and Examples

Name: Block: Seat:

Finding Limits Graphically and Numerically

1. Consider the function $\dfrac{x^2 - 3x + 2}{x - 1}$. To sketch the graph, we need to know what is going on at $x = 1$.
   (a) Using a Table: Using your TI: Press [TBLSET] (aka 2nd [WINDOW]) to make

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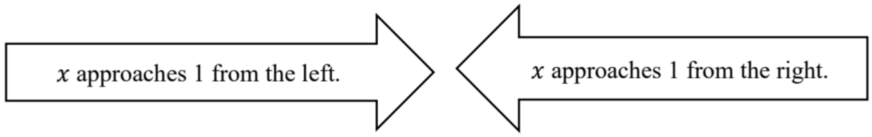
TABLE SETUP
 TblStart=0
 ΔTbl=1
Indpnt: Auto Ask
Depend: Auto Ask
```

and fill in the following



x	0.75	0.9	0.99	0.999	1	1.001	1.01	1.1	1.25
$f(x)$									

   (b) Now type the function in your TI as Y_1, Use [ZOOM] 4. and [TRACE] to see what is happening around $x = 1$.

   (c) Write the Limit expression:

   (d) We read this as "The ____________ of $f(x)$ as x approaches _______ is ____________"

2. Estimating a Limit Numerically:

$$\lim_{x \to 0} \frac{x}{\sqrt{x+1} - 1}$$

x	-0.1	-0.01	-0.001	-0.0001	0	0.0001	0.001	0.01	0.1
$f(x)$									

3. Estimating a Limit Numerically:

$$\lim_{x \to 3} \frac{(x^2 - 9)(x + 1)}{x - 3}$$

x	2.9	2.99	2.999	2.9999	3	3.0001	3.001	3.01	3.1
$f(x)$									

In general, even if $f(c) \neq L$, if $f(x)$ becomes arbitrarily close to a single number L as x approaches c from either side, we say that the limit of $f(x)$ as x approaches c is L. This limit is written:

4. One sided limits: Let $g(x) = \begin{cases} x^2 & \text{for } x < 1 \\ x+2 & \text{for } x > 1 \end{cases}$

   (a) $g(0) =$

   (b) $g(4) =$

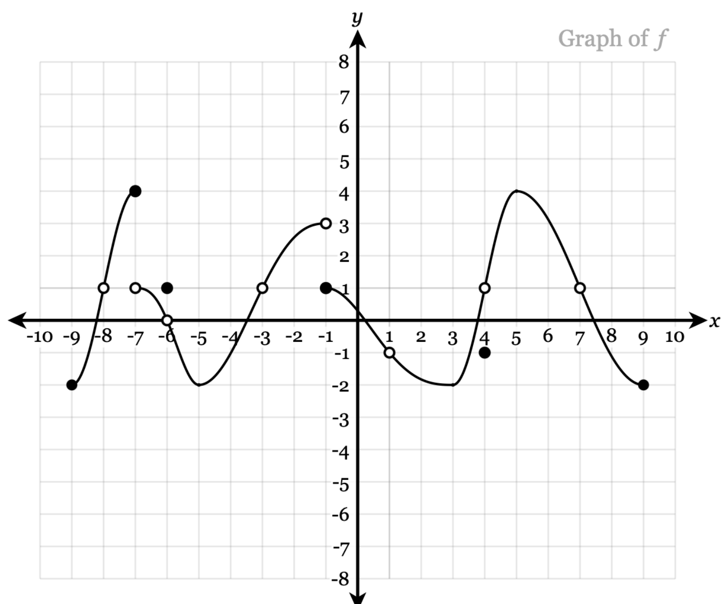
   (c) $g(1) =$

   (d) $\lim\limits_{x\to 1^-} g(x) =$

   (e) $\lim\limits_{x\to 1^+} g(x) =$

   (f) $\lim\limits_{x\to 1} g(x) =$

5. Finding a limit Graphically



   (a) $\lim\limits_{x\to -3} f(x) =$

   (b) $\lim\limits_{x\to -7^-} f(x) =$

   (c) $\lim\limits_{x\to -7^+} f(x) =$

   (d) $\lim\limits_{x\to -7} f(x) =$

   (e) $f(-6) =$

   (f) $\lim\limits_{x\to -6} f(x) =$

   (g) $\lim\limits_{x\to 4} f(x) =$

   (h) $\lim\limits_{x\to 5} f(x) =$

   (i) For what values of a is $\lim\limits_{x\to a} f(x) = 1$?

6. Examples of 3 types of Limits that Fail to exist

   (a) $\lim\limits_{x\to 0} \sin\left(\frac{1}{x}\right)$ why?

   (b) $\lim\limits_{x\to 2} \left(\frac{1}{|x-2|}\right)$ why?

   (c) If $f(x) = \begin{cases} -2, & \text{if } x \leq 3 \\ 3, & \text{if } x > 3 \end{cases}$, the $\lim\limits_{x\to 3} f(x) = D.N.E.$ why?