**12.1 Limits an Intro to Calculus**  
Objective: Use definition of limits to determine if limits exist and evaluate them

**Limt:**

**Estimating a Limit Numerically (whether f(x) at x = c exists or not)**

**Example 1:**

**x |** 1.9 1.99 1.999 **2.0** 2.001 2.01 2.1

**f(x) |** 3.7 3.97 3.997 **???** 4.003 4.03 4.3

Two sets (one from both the left and the right) of x-values approach 4…

\* Note: You can find the limit with direct substitution 3(2) – 2 = 4 \*

**Example 2:**

**x |** 1.9 1.99 1.999 **2.0** 2.001 2.01 2.1

**f(x) |** .2564 .2506 .25006 **???** .2499 .2493 .2439

Two sets (one from both the left and the right) of x-values approach 0.25…

Even though x=2 is undefined we say the limit as x approaches 2 is 0.25

**Example 3:**

**x |** 2.9 2.99 2.999 **3.0** 3.001 3.01 3.1

**f(x) |** -10 -100 -1000 **???** 1000 100 10

does not exists…  
  
Because f(x) is not approaching a unique number L as x approaches 3 we can conclude that this limit does not exist.

**Note:**  (a hole at -3 and a vertical asy at 3)

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