# Bell Work

*Graph then state the domain, range, x-intercept, y-intercept, vertical and horizontal asymptotes, holes. If an item does not exist, write 'none'*

$$y = \frac{x^2 - 25}{x - 5}$$

# Follow up question…

$How\ would\ this\ change\ if\ we\ had$:

$$y = \frac{x - 5}{x^2 - 25}$$

# For Last Time…

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# PRE-CALC TRIG

Day 18

# 12.1 Limits an Intro to Calculus

- **Objective:** Use definition of limits to determine if limits exist and evaluate them

- **HLQ:** How would a limit that approaches infinity impact a rational expression with the only variable being located in the denominator?

# Definition of Limit

If $f(x)$ becomes arbitrarily close to a unique number L as x $approaches\ c\ from\ either\ side,$ $the\ limit\ of\ \ f(x)$ as x approaches c is L.

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

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

- Example 1: $\lim_{x \to 2} (3x - 2)$

| x | 1.9 | 1.99 | 1.999 | **2.0** | 2.001 | 2.01 | 2.1 |
|---|---|---|---|---|---|---|---|
| f(x) | | | | | | | |

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

Example 1: $\lim_{x \to 2} (3x - 2)$

| 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…

# Example 1 Solution:

$$\boldsymbol{\lim_{x \to 2} (3x - 2) = 4}$$

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

Example 2: $\lim_{x \to 2} \frac{x-2}{x^2-4}$

| x | 1.9 | 1.99 | 1.999 | **2.0** | 2.001 | 2.01 | 2.1 |
|---|---|---|---|---|---|---|---|
| f(x) | | | | | | | |

## Example 2: $\lim_{x \to 2} \frac{x-2}{x^2-4}$

| x | 1.9 | 1.99 | 1.999 | **2.0** | 2.001 | 2.01 | 2.1 |
|---|---|---|---|---|---|---|---|
| f(x) | .2564 | .2506 | .25006 | ______ | .2499 | .2493 | .2439 |

# Example 2 Solution

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

$$\lim_{x \to 2} \frac{x-2}{x^2-4} = 0.25$$

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

## Example 3: $\lim_{x \to 3} \frac{x+3}{x^2-9} = \frac{x+3}{(x+3)(x-3)}$

| x | 2.9 | 2.99 | 2.999 | **3.0** | 3.001 | 3.01 | 3.1 |
|---|---|---|---|---|---|---|---|
| f(x) | -10 | -100 | -1000 | ____ | 1000 | 100 | 10 |

$\lim_{x \to 3} \frac{x+3}{x^2-9}$ 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.

# Additional Note on Example 3

**Note:** $\lim_{x \to -3} \frac{x+3}{x^2-9} = -0.17$

Therefore, a hole exists at -3

and a vertical asymptote at 3

# For next time…

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