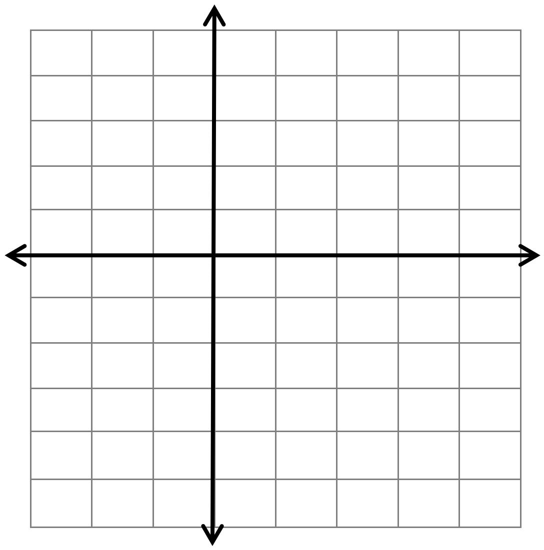
<u>Section 1.5</u> <u>(Infinite Limits)</u>

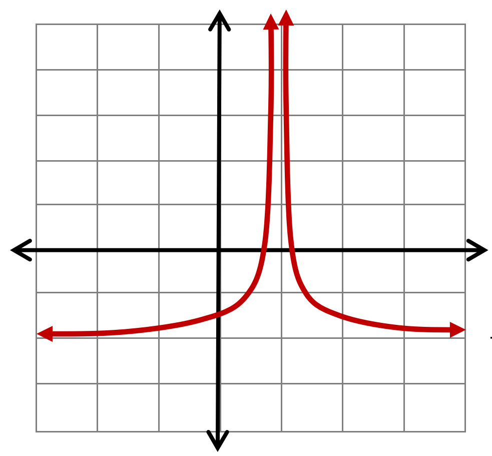
Examine the function **f(x) =** $\frac{2}{x-1}$ … What does the graph look like? What is the domain? What happens as x approaches 1? From the left? From the right



x	**f(x) =** $\frac{2}{x-1}$
0	
0.5	
0.9	
0.99	
1.001	

A limit in which f(x) increases or decreases without bound as x approaches c is called an infinite limit (DNE)

<u>Example</u>: Determine the limit of the following graph as x approaches 1 from the left and right…



If f(x) approaches ± infinity as x approaches c, then x = c is a vertical asymptote of the function.

Given ***simplified*** rational function $f(x) = \frac{p(x)}{q(x)}$, if *c* is a zero of *q(x)*, then *x* = *c* is a vertical asymptote of *f(x)*

<u>Examples</u>: Determine the vertical asymptotes of the following…

f(x) = $\frac{2}{3(x+2)}$ g(x) = $\frac{x^2+9}{x^2-9}$ h(x) = tan(x) f(x) = $\frac{x^2+2x-15}{x^2-9}$

Homework problems: 1,5,6,13,15,18,24,29,37,39,43,49,67 (required) 19,44,54,66,69 (recommended)

Example: Determine $\lim_{x\to 1} \frac{x^2-2x}{x-1}$

Consider the following properties of infinite limits when examining problems of this type…

Let c and L be real numbers and let f and g be functions such that $\lim_{x\to c} f(x) = \infty$ and $\lim_{x\to c} g(x) = L$

1. Sum or difference: $\lim_{x\to c}[f(x) + g(x)] = \infty$
2. Product: $\lim_{x\to c}[f(x)g(x)] = \infty$ (if L>0 or negative infinity if L < 0)
3. Quotient: Sum or difference: $\lim_{x\to c} \frac{g(x)}{f(x)}$ **= 0**

Examples: Evaluate the following limits…

$\lim_{x\to 0}\left(4 + \frac{2}{x^2}\right)$ $\lim_{x\to 1^-} \frac{x^2+1}{csc(x\pi)}$ $\lim_{x\to 0^+}[3\,cot(x)]$

Application Example: Clark Griswold is hanging Christmas lights again when the base of his 25-ft. ladder begins to slide out from the wall of the house at a rate of 2 feet per second. The top of the ladder is moving down the wall at a rate of r = $\frac{2x}{\sqrt{x^2-625}}$ feet per second, where x is the distance of the base of the ladder from the wall.

(a) Find the rate r when x is 8 feet

(b) Find the rate r when x is 16 feet

(c) Find the limit of r as x approaches 25 feet

Homework problems: 1,5,6,13,15,18,24,29,37,39,43,49,67 (required) 19,44,54,66,69 (recommended)