## Infinite Limits

**w-up: Make a basic sketch for each graph**

A) $f(x)=\frac{1}{x}$ B) $f(x)=\frac{1}{x^2}$ C) $f(x)=\frac{2}{x-4}$ C) $f(x)=\frac{2}{(x-4)^2}$

What is the impact on each graph if the rational expression is NEGATIVE?

Infinite Limit: A limit that does not exist but may **increase** without bound ( $+\infty$ ) or **decrease** without bound ( $-\infty$ )

Note: the infinity symbol ( $\pm\infty$ ) tells us more specifically how the limit fails to exist.

Where do infinite limits occur on a graph?

EX1) A) $\lim_{x\to 3^+}\frac{2}{x-3}$ = _____ B) $\lim_{x\to 3^-}\frac{2}{x-3}$ = _____ C) $\lim_{x\to 3}\frac{2}{x-3}$ = _____

EX2) $\lim_{x\to 3}\frac{2}{(x-3)^2}$

EX3) $\lim_{x\to(\pi/2)^+} -2\sec x$

# Properties of Infinite Limits

**GIVEN**: $\lim_{x\to c} f(x)=\infty$ and $\lim_{x\to c} g(x)=L$ (some finite limit)

$$\lim_{x\to c} f(x)\pm g(x)=\infty$$

$$\lim_{x\to c} \frac{f(x)}{g(x)}=\pm\infty \quad \text{and} \quad \lim_{x\to c} \frac{g(x)}{f(x)}=0$$

$$\lim_{x\to c} f(x)\bullet g(x)=\pm\infty$$

Indeterminate Forms: Cannot determine limit based on any of the following

$$0\bullet\infty \qquad \infty-\infty \qquad \frac{0}{0} \qquad \frac{\infty}{\infty} \qquad 1^{\infty} \qquad \infty^{0} \qquad 0^{0}$$

When evaluating infinite limits without a calculator, use your knowledge of graphs along with the properties of limits and infinite limits.

EX) $\lim_{x\to 0} 3+\frac{2}{x^2}$ EX) $\lim_{x\to -1^+} \frac{x+2}{x+1}$ EX) $\lim_{x\to 4^-} \frac{1}{x^2-16}$ EX) $\lim_{x\to 0^+} \frac{|x|}{x}$