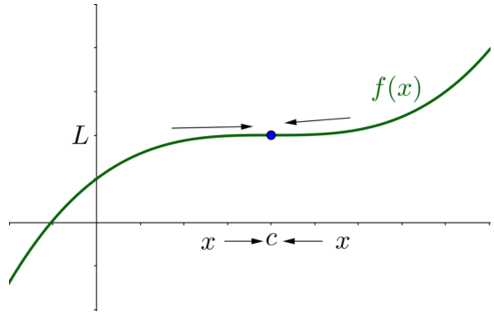
# Precalculus

12-01 Introduction to Limits

## Limit

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

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



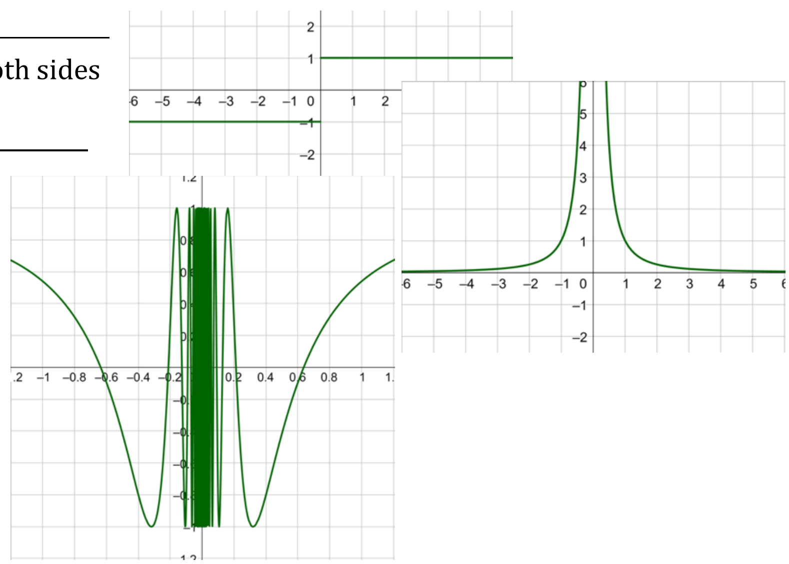

## Ways to find limits

- Estimate Numerically (_______________)

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

## Limits that fail to exist

1. $f(x)$ approaches __________ numbers from both sides
2. $f(x)$ increases or decreases without _______________
3. $f(x)$ _______________ between 2 fixed values



## Properties of Limits

- $\lim_{x \to c} b = b$
- $\lim_{x \to c} x = c$
- $\lim_{x \to c} x^n = c^n$
- $\lim_{x \to c} \sqrt[n]{x} = \sqrt[n]{c}$
- Let $\lim_{x \to c} f(x) = L$ and $\lim_{x \to c} g(x) = K$
  - $\lim_{x \to c} bf(x) = bL$
  - $\lim_{x \to c} [f(x) \pm g(x)] = L \pm K$
  - $\lim_{x \to c} f(x)g(x) = LK$
  - $\lim_{x \to c} \frac{f(x)}{g(x)} = \frac{L}{K}$
  - $\lim_{x \to c} [f(x)]^n = L^n$

Evaluate

$\lim_{x \to 2} 3x^2$ $\quad$ $\lim_{x \to 1} (4x^3 - 2x^2 + 17)$ $\quad$ $\lim_{x \to 2} \frac{x^2 - 4}{x}$