

AP Calculus

1.6 Calculating Limits Using the Limit Laws

$$\lim_{x \rightarrow a} k = k \quad (\text{where } k \text{ is a constant})$$

$$\lim_{x \rightarrow a} (f(x) + g(x)) = \lim_{x \rightarrow a} f(x) + \lim_{x \rightarrow a} g(x)$$

$$\lim_{x \rightarrow a} (f(x) - g(x)) = \lim_{x \rightarrow a} f(x) - \lim_{x \rightarrow a} g(x)$$

$$\lim_{x \rightarrow a} (f(x) \cdot g(x)) = \lim_{x \rightarrow a} f(x) \cdot \lim_{x \rightarrow a} g(x)$$

$$\lim_{x \rightarrow a} \left(\frac{f(x)}{g(x)} \right) = \frac{\lim_{x \rightarrow a} f(x)}{\lim_{x \rightarrow a} g(x)} \quad (\text{where } \lim_{x \rightarrow a} g(x) \neq 0)$$

$$\lim_{x \rightarrow a} (kf(x)) = k \lim_{x \rightarrow a} f(x) \quad (\text{where } k \text{ is a constant})$$

$$\lim_{x \rightarrow a} (f(x))^n = \left[\lim_{x \rightarrow a} f(x) \right]^n$$

Example: Find each limit.

a) $\lim_{x \rightarrow 3} (x^2 - 4x + 7)$

b) $\lim_{x \rightarrow -2} \left(\frac{2x^2 - 1}{x + 4} \right)$

$$\text{c) } \lim_{x \rightarrow 3} \left(\frac{x^2 - 9}{x - 3} \right)$$

$$\text{d) } \lim_{x \rightarrow 2} \left(\frac{3x - 6}{x^2 - 5x + 6} \right)$$

$$\text{e) } \lim_{x \rightarrow 6} \sqrt{x^2 - 11}$$

$$\text{f) } \lim_{x \rightarrow 1} \frac{\sqrt{x+3} - 2}{x-1}$$

$$\text{h) } \lim_{x \rightarrow 2} f(x) \text{ where } f(x) = \begin{cases} x^2, & x \leq 2 \\ 3x - 2, & x > 2 \end{cases}$$