Precalculus
Lesson 14.2: Algebra Techniques for Finding Limits
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Limit Laws

$$\lim_{x\to a} f(x) \qquad \text{and} \qquad \lim_{x\to a} g(x)$$

$$1. \lim_{x\to a}\left[f(x)+g(x)\right] = \lim_{x\to a} f(x) + \lim_{x\to a} g(x)$$

$$2. \lim_{x\to a}\left[f(x)-g(x)\right] = \lim_{x\to a} f(x) - \lim_{x\to a} g(x)$$

$$3. \lim_{x\to a}\left[cf(x)\right] = c\lim_{x\to a} f(x)$$

$$4. \lim_{x\to a}\left[f(x)g(x)\right] = \lim_{x\to a} f(x) \cdot \lim_{x\to a} g(x)$$

$$5. \lim_{x\to a}\frac{f(x)}{g(x)} = \frac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)}$$

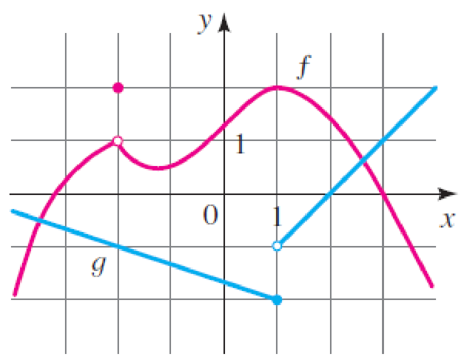
$$6. \lim_{x\to a}\left[f(x)\right]^n = \left[\lim_{x\to a} f(x)\right]^n$$

$$7. \lim_{x\to a}\sqrt[n]{f(x)} = \sqrt[n]{\lim_{x\to a} f(x)}$$

Using the Limit Laws

Use the limit laws and the graphs of f and g in Figure
to evaluate the following limits, if they exist.

$$\lim_{x\to -2}[f(x)+5g(x)]$$



$$\lim_{x\to 1}[f(x)g(x)]$$

$$\lim_{x\to 2}\frac{f(x)}{g(x)}$$

$$\lim_{x\to 1}[f(x)]^3$$

Some Special Limits

$$1. \lim_{x \to a} c = c$$

$$2. \lim_{x \to a} x = a$$

$$3. \lim_{x \to a} x^n = a^n$$

$$4. \lim_{x \to a} \sqrt[n]{x} = \sqrt[n]{a}$$

Limits by Direct Substitution:

$$\lim_{x \to a} f(x) = f(a)$$

Using the Limit Laws: Evaluate the following limits.

$$\lim_{x \to 5} 2x^2 - 3x + 4$$

$$\lim_{x \to -2} \frac{x^3 + 2x^2 + 1}{5 - 3x}$$

Finding Limits by Direct Substitution: Evaluate the following limits.

$$\lim_{x \to 3} 2x^3 - 10x - 8$$

$$\lim_{x \to -1} \frac{x^2 + 5x}{x^4 + 2}$$

Finding a Limit by Canceling a Common Factor

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

Finding a Limit by Simplifying

$$\lim_{h \to 0} \frac{(3+h)^2-9}{h}$$

Finding a Limit by Rationalizing

$$\lim_{t \to 0} \frac{\sqrt{t^2+9}-3}{t^2}$$

Comparing Right and Left Limits: Show that

$$\lim_{x \to 0} |x| = 0$$

Prove that

$$\lim_{x\to 0}\frac{|x|}{x} = \text{DNE}$$

The Limit of a Piecewise Defined Function

$$f(x) = \begin{cases} \sqrt{x-4} & if\ x > 4 \\ 8-2x & if\ x < 4 \end{cases}$$

find:

$$\lim_{x\to 4} f(x)$$