

Strategies for Finding Limits

#3

p. 98-114 (2.2-2.3)

1. Try direct substitution
2. Try factor, cancellation technique
3. Use graphing or a table to reinforce

*For substitution:*Let b and c be real numbers and n be a positive number.

$$\lim_{x \rightarrow c} b = b$$

$$\lim_{x \rightarrow c} x = c$$

$$\lim_{x \rightarrow c} x^n = c^n$$

For polynomials, radicals, and composite functions, direct substitution will find the limit of a real number.

For rational and trigonometric functions, as long as the limit does not converge to a vertical asymptote, direct substitution finds the limit.

Find the limits:

$$1. \lim_{x \rightarrow 2} \frac{\sqrt{3x^2}}{x} = \frac{\sqrt{3(2)^2}}{2} = \frac{\sqrt{12}}{2} = \frac{2\sqrt{3}}{2} = \sqrt{3}$$

$$2. \lim_{x \rightarrow 1} \frac{x^2 + 5x - 6}{x - 1} = \frac{(x+6)(x-1)}{x-1} = 7$$

3.

$$\lim_{x \rightarrow \pi/6} (\cos(x)) = \cos \frac{\pi}{6} = \frac{\sqrt{3}}{2}$$

** 4. If $a \neq 0$, then $\lim_{x \rightarrow a} \frac{x - a}{x^4 - a^4}$ is ____.

$$\lim_{x \rightarrow a} \frac{1}{(x+a)(x^2+a^2)} = \frac{1}{(a+a)(a^2+a^2)} = \frac{1}{2a(2a^2)} = \frac{1}{4a^3}$$

5. $\lim_{x \rightarrow \pi} x(\sec(x))$

$$= \pi(\sec \pi) = \frac{\pi}{\cos \pi} = \frac{\pi}{-1} = -\pi$$

** 6. If $g(x) = 3x^3 - 5$, then $\lim_{x \rightarrow 0} \frac{g(x) - g(0)}{x^3}$ is ____.

$$g(0) = 3(0)^3 - 5 = -5$$

$$\frac{3x^3 - 5 - (-5)}{x^3} = \frac{3x^3}{x^3} = 3$$