Limits — By substitution

Name: _____ Date: _____

Find each limit. Check the bottom first: if it is not 0 there, substitute.

1. $\lim_{x \to -2} \frac{x - 2}{x - 3}$

$$\lim_{x \to -2} \frac{x - 2}{x - 3} = \frac{(-2) - 2}{(-2) - 3}$$
$$= \frac{-4}{-5}$$
$$= \frac{4}{5}$$

2. $\lim_{x \to -2} (x^2 + 2x + 3)$

3. $\lim_{x \to -1} (x^2)$

4. $\lim_{x \to 1} \frac{x - 1}{x + 1}$

5. $\lim_{x \to -1} (x^2 - 2x - 1)$

6. $\lim_{x \to -2} (-x^2 + x - 2)$

Limits — Factor and cancel

Name: _____ Date: _____

Substituting makes the top and bottom both 0: factor first, then cancel.

1 $\lim_{x \to 3} \frac{x^2 - 5x + 6}{x^2 - 3x}$

$x = 3$: $\frac{0}{0}$

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

$= \lim_{x \to 3} \frac{x - 2}{x}$

$= \frac{1}{3}$

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

3 $\lim_{x \to -3} \frac{x^2 + 4x + 3}{x^2 + 5x + 6}$

4 $\lim_{x \to -1} \frac{x^2 - 2x - 3}{x^2 + 4x + 3}$

5 $\lim_{x \to -2} \frac{x^2 + x - 2}{x^2 - x - 6}$

6 $\lim_{x \to -3} \frac{x^2 + 3x}{x^2 + 2x - 3}$

Limits — As x → ∞

Name: _____ Date: _____

Find each limit. Divide every term by the highest power of x on the bottom.

1. $\lim_{x\to\infty} \frac{-3x}{3x+3}$

$\lim_{x\to\infty} \frac{-3}{3+3/x}$

$= \frac{-3}{3+0}$

$= -1$

2. $\lim_{x\to\infty} \frac{2x+2}{3x^2+3}$

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

4. $\lim_{x\to\infty} \frac{-2x}{x^2-3}$

5. $\lim_{x\to\infty} \frac{2x-3}{2x+3}$

6. $\lim_{x\to\infty} \frac{3x+1}{x-2}$

Limits — Mixed

Name: _____ Date: _____

Find each limit. Substitute first; what you get decides the next move.

1. $\lim_{x\to\infty} \dfrac{x-3}{3x+2}$

$\lim_{x\to\infty} \dfrac{1-3/x}{3+2/x}$

$= \dfrac{1+0}{3+0}$

$= \dfrac{1}{3}$

2. $\lim_{x\to-1} \dfrac{x^2+x}{x^2+4x+3}$

3. $\lim_{x\to3} \dfrac{x^2-4x+3}{x^2-2x-3}$

4. $\lim_{x\to\infty} \dfrac{-2x^2+2x-3}{2x^2+3}$

5. $\lim_{x\to-1} (x^2+x-2)$

6. $\lim_{x\to3} \dfrac{x+3}{x-1}$

Power Pack · Limits — Answer key

By substitution

1. $\lim_{x \to -2} \frac{x-2}{x-3} = \frac{4}{5}$
2. $\lim_{x \to -2} (x^2 + 2x + 3) = 3$
3. $\lim_{x \to -1} (x^2) = 1$
4. $\lim_{x \to 1} \frac{x-1}{x+1} = 0$
5. $\lim_{x \to -1} (x^2 - 2x - 1) = 2$
6. $\lim_{x \to -2} (-x^2 + x - 2) = -8$

By factoring a 0/0

1. $\lim_{x \to 3} \frac{x^2 - 5x + 6}{x^2 - 3x} = \frac{1}{3}$
2. $\lim_{x \to -2} \frac{x^2 + 2x}{x^2 + 3x + 2} = 2$
3. $\lim_{x \to -3} \frac{x^2 + 4x + 3}{x^2 + 5x + 6} = 2$
4. $\lim_{x \to -1} \frac{x^2 - 2x - 3}{x^2 + 4x + 3} = -2$
5. $\lim_{x \to -2} \frac{x^2 + x - 2}{x^2 - x - 6} = \frac{3}{5}$
6. $\lim_{x \to -3} \frac{x^2 + 3x}{x^2 + 2x - 3} = \frac{3}{4}$

At infinity

1. $\lim_{x \to \infty} \frac{-3x}{3x + 3} = -1$
2. $\lim_{x \to \infty} \frac{2x + 2}{3x^2 + 3} = 0$
3. $\lim_{x \to \infty} \frac{-2x^2 + 2x - 1}{3x^2 + 1} = -\frac{2}{3}$
4. $\lim_{x \to \infty} \frac{-2x}{x^2 - 3} = 0$
5. $\lim_{x \to \infty} \frac{2x - 3}{2x + 3} = 1$
6. $\lim_{x \to \infty} \frac{3x + 1}{x - 2} = 3$

Choose the method

1. $\lim_{x \to \infty} \frac{x - 3}{3x + 2} = \frac{1}{3}$
2. $\lim_{x \to -1} \frac{x^2 + x}{x^2 + 4x + 3} = -\frac{1}{2}$
3. $\lim_{x \to 3} \frac{x^2 - 4x + 3}{x^2 - 2x - 3} = \frac{1}{2}$
4. $\lim_{x \to \infty} \frac{-2x^2 + 2x - 3}{2x^2 + 3} = -1$
5. $\lim_{x \to -1} (x^2 + x - 2) = -2$
6. $\lim_{x \to 3} \frac{x + 3}{x - 1} = 3$