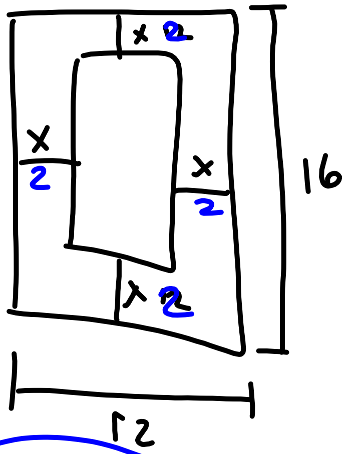


12 x 8 ft

0-4+
5-7 ✓
8↑-

a) $(16-2x)(12-2x)=96$

c) $192-32x-24x+4x^2=96$

$-96 \qquad\qquad -96$

$\frac{4x^2}{4}-\frac{56x}{4}+\frac{96}{4}=\frac{0}{4}$

$x^2-14x+24=0$

$(x-12)(x-2)=0$

$x-12=0 \qquad x-2=0$

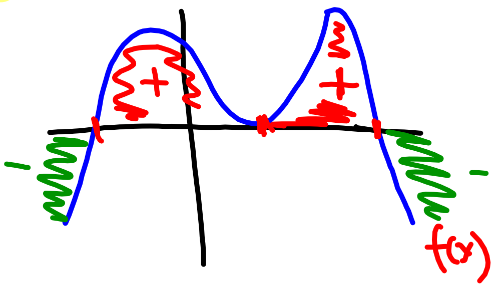
$+12 \quad +12 \qquad +2 \quad +2$

$\cancel{x=12} \qquad x=2$

2-6 Study Guide and Intervention

Nonlinear Inequalities

Polynomial Inequalities Real zeros divide the x-axis into intervals for which the value of $f(x)$ is positive (above the x-axis) or negative (below the x-axis). A **sign chart** shows these real zeros and the sign of $f(x)$ in that interval as either positive (+) or negative (–).



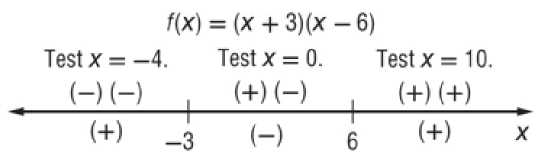
Example: Solve each inequality.

a. $x^2 - 3x - 15 > 3$

$x^2 - 3x - 15 > 3$	Original inequality
$x^2 - 3x - 18 > 0$	Subtract 3 from each side of the inequality.
$(x + 3)(x - 6) > 0$	Factor.

Let $f(x) = (x + 3)(x - 6)$.
$f(x)$ has real zeros at $x = -3$ and $x = 6$.

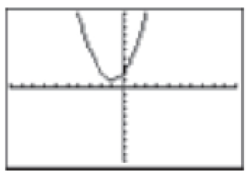
Create a sign chart using these real zeros. Substitute any number from each interval for x in the factored function rule. Write the sign of each factor and the sign of the product of the factors.



Because we are solving for when $x^2 - 3x - 18 > 0$, we choose the intervals for which the product is positive. The solution is $(-\infty, -3)$ or $(6, \infty)$.

b. $x^2 + 2x + 2 < 0$

The related function has no real zeros. The graph is always above the x-axis so the values of $f(x)$ are always positive. Because we are solving for when the values are negative, the equation has no real solution.



[−10, 10] scl: 1 by [−10, 10] scl: 1

Exercises
Solve each inequality.

1. $x^3 - 3x - 2 < 0$

$x = -1 \quad x = 2$

$-$ $\quad -$ $\quad +$

$x=-2$ $\quad -1 \quad x=0 \quad 2 \quad x=3$

$(-2)^3 - 3(-2) - 2 \quad (0)^3 - 3(0) - 2 \quad (3)^3 - 3(3) - 2$

$-4 \quad -2 \quad 16$

$\boxed{(-\infty, -1) \cup (-1, 2)}$

2. $x^2 + 2x + 1 > 0$

$(x+1)(x+1)$

$x + 1 = 0$
$-1 \quad -1$
$x = -1$

$+ \quad +$

$x=-2 \quad -1 \quad x=0$

$(-2)^2 + 2(-2) + 1 \quad (0)^2 + 2(0) + 1$

$1 \quad 1$

$\boxed{(-\infty, -1) \cup (-1, \infty)}$

Rational Inequalities A **rational inequality** can change signs at its points of discontinuity as well as its real zeros. You must include the zeros of both the numerator and denominator in your sign chart.

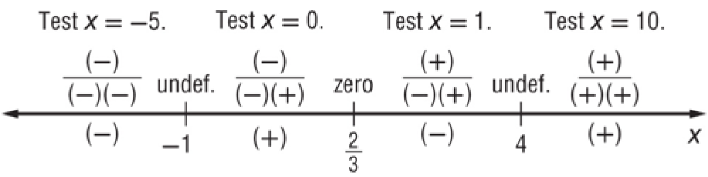
Example: Solve $\frac{2}{x-4} + \frac{1}{x+1} > 0$.

$\frac{2}{x-4} + \frac{1}{x+1} > 0$ Original inequality

$\frac{2x+2+x-4}{(x-4)(x+1)} > 0$ Use the LCD, $(x - 4)(x - 1)$, to combine the fractions.

$\frac{3x-2}{(x-4)(x+1)} > 0$ Simplify.

Let $f(x) = \frac{3x-2}{(x-4)(x+1)}$. The zeros and undefined points are the zeros of the numerator, $x = \frac{2}{3}$, and denominator, $x = 4$ and $x = -1$. Create a sign chart using these numbers. Test x-values in each interval.



The solutions are the intervals for which the final sign is positive: $(-1, \frac{2}{3})$ or $(4, \infty)$.

Exercises
Solve each inequality.

1. $\frac{x-1}{x+2} > 3$

$-3 \quad -3$

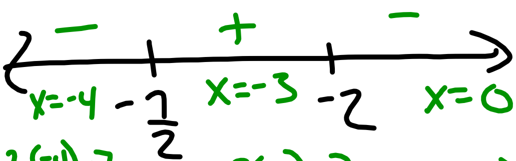
$\frac{x-1}{x+2} - \frac{3(x+2)}{1(x+2)} > 0$

$\frac{x-1-3x-6}{x+2} > 0$

$\frac{-2x-7}{x+2} > 0$

$-2x-7=0$
$+7 \quad +7$
$\frac{-2x}{-2} = \frac{7}{-2}$
$x = -\frac{7}{2}$

$x+2=0$
$-2 \quad -2$
$x=-2$



$x=-4$: $\frac{-2(-4)-7}{-4+2} = -\frac{1}{2}$

$x=-3$: $\frac{-2(-3)-7}{-3+2} = 1$

$x=0$: $\frac{-2(0)-7}{0+2} = -\frac{7}{2}$

$\boxed{\left(-\frac{7}{2}, -2\right)}$

2. $\frac{x+2}{x-4} \le 1$

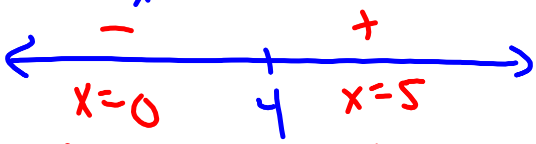
$-1 \quad -1$

$\frac{x+2}{x-4} - \frac{1(x-4)}{1(x-4)} \le 0$

$\frac{x+2-x+4}{x-4} \le 0$

$\frac{6}{x-4} \le 0$

$x-4=0$
$+4 \quad +4$
$x=4$



$x=0$: $\frac{6}{0-4} = -\frac{3}{2}$

$x=5$: $\frac{6}{5-4} = 6$

$\boxed{(-\infty, 4)}$

HW:

p.145,

1, 7, 13, 21, 27, 29, 31