

Inequalities in One Variable

Review:

- Write an inequality for:
 - $(-2, 6]$ $-2 < x \leq 6$
 - $[4, \infty)$ $4 \leq x < \infty$
- Solving inequalities – Main thing to remember is when multiplying or dividing by a negative, be sure to switch the direction of the inequality.

- EX: Solve: $6x - 4 \leq 2 + 8x$

$$\begin{aligned}
 &+4 \quad +4 \\
 6x &\leq 6 + 8x \\
 -8x &\quad -8x \\
 -2x &\leq 6 \\
 \frac{-2x}{-2} &\leq \frac{6}{-2} \\
 x &\geq -3
 \end{aligned}$$



- Solve: $3 + \frac{2}{7}x > x - 2$

$$\begin{aligned}
 &\frac{2x}{7} - \frac{1}{7}x > -5 \\
 &= \frac{2-7}{7}
 \end{aligned}$$

$$\begin{aligned}
 &\rightarrow \quad -3 \\
 \frac{2}{7}x &> x - 5 \\
 -x &\quad -x \\
 \frac{2}{7}x - \frac{1}{7}x &> -5 \\
 -\frac{7}{5}\left(-\frac{5}{7}\right)x &> -\frac{5}{1}\left(-\frac{7}{5}\right) \\
 x &< 7
 \end{aligned}$$



- Solving absolute value inequalities: Handled the same as solving absolute value equations.

- Solve: $|1 - 2x| < 5$

$$\begin{aligned}
 &1 - 2x < 5 \\
 &-1 \quad -1 \\
 &\underline{-2x < 4} \\
 &\underline{-2 \quad -2} \\
 &x > -2
 \end{aligned}$$



$$\begin{aligned}
 &-(1 - 2x) < 5 \\
 &-1 + 2x < 5 \\
 &+1 \quad +1 \\
 &\underline{2x < 6} \\
 &\underline{2 \quad 2} \\
 &x < 3
 \end{aligned}$$

$$x < 3$$

$$\begin{aligned}
 &-(1 - 2x) < 5 \\
 &-1 \quad -1 \\
 &\underline{1 - 2x > -5} \\
 &-1 \quad -1 \\
 &\underline{-2x > -6} \\
 &\underline{-2 \quad -2} \\
 &x < 3
 \end{aligned}$$

- Solve: $2|x + 10| \geq 9$

$$|x + 10| \geq \frac{9}{2}$$

$$\begin{aligned}
 x + 10 &\geq \frac{9}{2} \\
 -10 \quad -10 \\
 x &\geq \frac{9}{2} - \frac{10}{1} \\
 x &\geq \frac{9 - 20}{2} \\
 x &\geq -\frac{11}{2}
 \end{aligned}$$

$$x \geq -\frac{11}{2}$$

$$\begin{aligned}
 -(x + 10) &\geq \frac{9}{2} \\
 -x - 10 &\geq \frac{9}{2} \\
 +10 \quad +10 \\
 -x &\geq \frac{9}{2} + \frac{10}{1} \\
 x &\leq -\frac{9}{2} - \frac{10}{1} \\
 x &\leq \frac{-9 - 20}{2} \\
 x &\leq -\frac{29}{2}
 \end{aligned}$$

$$x \leq -\frac{29}{2}$$

Solving Polynomial Inequalities

- Find all zeros
- Put zeros in order from least to greatest
- "Cover" entire number line
- Select test values in each interval

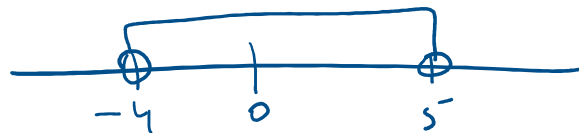
○ EX: Solve: $x^2 - x - 20 < 0$. Then graph solution set.

$$(x+4)(x-5)$$

zero's: $-4, 5$

$-\infty < x < -4$	$-4 < x < 5$	$5 < x < \infty$
Test: $x = -5$	$x = 0$	$x = 6$
$(-5)^2 - (-5) - 20 < 0$	$-20 < 0$	$10 < 0$
X	✓	X

$$-4 < x < 5$$



○ EX: Solve: $4x^2 - 5x - 6 > 0$

$$4x^2 - 5x - 6 > 0$$

$$(4x + 3)(x - 2)$$

$$x = -\frac{3}{4}, 2$$

$$(-\infty, -\frac{3}{4}) \quad -\frac{3}{4} < x < 2 \quad 2 < x < \infty$$

$$x = -1$$

✓

$$x = 0$$

X

$$x = 3$$

✓

