

Solving Inequalities Algebraically

Solving a polynomial function algebraically means:

* Find the x -intercepts
FACTOR then solve

When solving an inequality we do the same thing.

But then look at the intervals between the zeros

ex Solve

$$x^2 + 3x + 2 > 0$$

$$(x+1)(x+2) > 0$$

$$\begin{array}{l} \downarrow \\ x+1=0 \\ x=-1 \end{array}$$

$$\begin{array}{l} \downarrow \\ x+2=0 \\ x=-2 \end{array}$$

Solve

$$(x+3)(2x-3) > 0$$

1. What are the zeros?

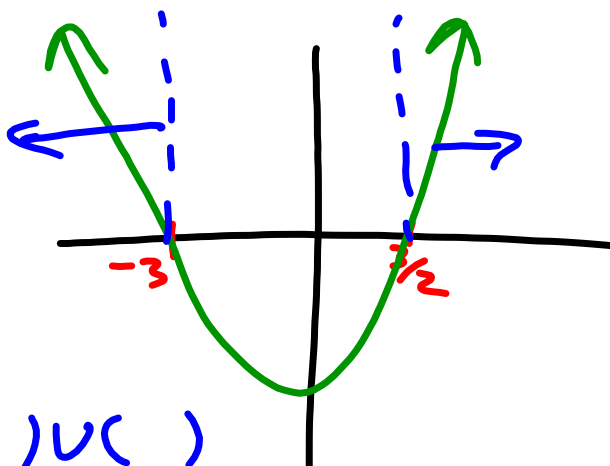
$$x = -3 \quad \text{and} \quad x = \frac{3}{2}$$

2. Create a table showing the intervals

	$(-\infty, -3)$	-3	$(-3, \frac{3}{2})$	$\frac{3}{2}$	$(\frac{3}{2}, \infty)$
$(x+3)$	-	0	+	+	+
$(2x-3)$	-	-	-	0	+
$f(x)$	+	0	-	0	+

3. Check any value between the zeros and in the domain $(-\infty, a)$ and (b, ∞)

4. Determine if the function is positive or negative on that interval.



$$(x+3)(2x-3) > 0$$

on the intervals

$$(-\infty, -3) \cup (\frac{3}{2}, \infty)$$

$$(-\infty, -3) \cup (\frac{3}{2}, \infty)$$

You can also check the values in the original function

$$(x+3)(2x-3) > 0$$

zeros (-3) and $(\frac{3}{2})$

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

$$=(-1)(-11)$$

$$=11 \rightarrow \text{positive}$$

$$(0+3)(2(0)-3)$$

$$=(3)(-3)$$

$$=-9 \rightarrow \text{Neg.}$$

Solve the inequality $-2x^3 - 6x^2 + 12x + 16 \leq 0$

$$-2(x^3 + 3x^2 - 6x - 8)$$

$$\begin{array}{l} \pm 1 \quad \pm 2 \\ \pm 4 \quad \pm 8 \end{array}$$

$$x = -2 \rightarrow -8 + 12 + 12 - 8$$

$$x = 2 \rightarrow 8 + 12 - 12 - 8 = 0 \quad (x-2) \text{ is a factor}$$

$$\begin{array}{r|rrrr} 2 & 1 & 3 & -6 & -8 \\ & & 2 & 10 & 8 \\ \hline & 1 & 5 & 4 & 0 \end{array} \checkmark$$

$$\boxed{-2(x-2)(x^2+5x+4)}$$

Factor

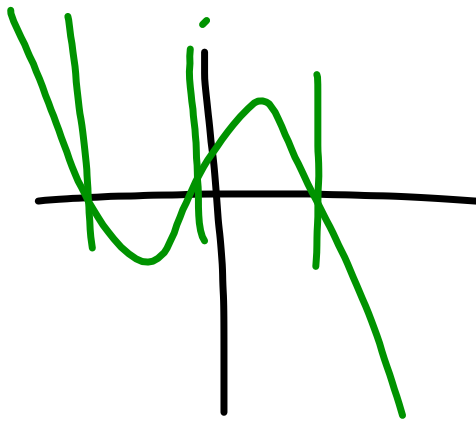
$$\rightarrow \underline{\underline{-2(x-2)(x+1)(x+4)}}$$

$$\textcircled{-2(x-2)(x+1)(x+4)} \geq 0$$

$$\text{Zeros} \rightarrow 2, -1, -4$$

	$(-\infty, -4)$	-4	$(-4, -1)$	-1	$(-1, 2)$	2	$(2, \infty)$
$(x-2)$	-	-	-	-	-	0	+
$(x+1)$	-	-	-	0	+	+	+
$(x+4)$	-	0	+	+	+	+	+
$f(x)$	+	0	-	0	+	0	-
	✓	✓	✗	✓	✓	✓	✗

$$f(x) \geq 0 \text{ on the intervals } (-\infty, -4] \cup [-1, 2]$$



Homework

pg. 138 # 4, 6, 8

TEST WEDNESDAY

Review pg. 140 - 141