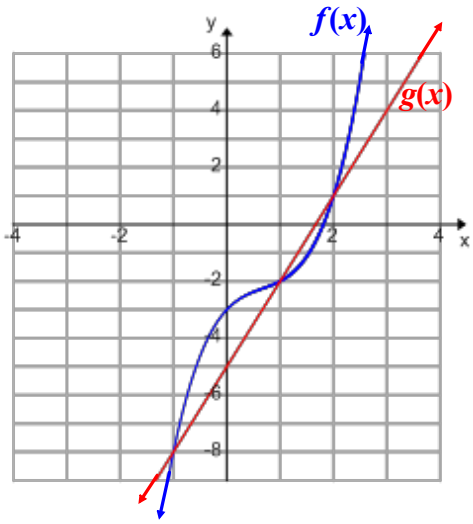
4.3 Solving Polynomial Inequalities (Day 2)

Math Learning Target:

"By the end of class, I can solve any polynomial inequality."

Ex. 1: For the functions $f(x)$ and $g(x)$, determine graphically the intervals for:



a) $f(x) > g(x)$

$(-1, 1) \cup (2, \infty)$

b) $g(x) > f(x)$ or $f(x) < g(x)$

$(-\infty, -1) \cup (1, 2)$

c) $f(x) = g(x)$

$x = -1, 1, 2$

or $[-1, -1] \cup [1, 1] \cup [2, 2]$

Entertainment: **Do #7 first...**pp.227-228 #7*ef, 3, 8, 9, 12**, 13**, 14, 15
Challenge: #18
* use desmos to confirm your answers;
** the text has answers rounded in the back, but you must state your answers as exact values

Ex. 2: Determine the intervals for $g(x) < f(x)$ given that

$f(x) = x^4 - 5x^3 + 4x^2 + 17x - 40$

$g(x) = 2x^3 - 5x^2 - 10x + 14$

$g(x) < f(x)$

$2x^3 - 5x^2 - 10x + 14 < x^4 - 5x^3 + 4x^2 + 17x - 40$

$2x^3 - 5x^2 - 10x + 14 - x^4 + 5x^3 - 4x^2 - 17x + 40 < 0$

$-x^4 + 7x^3 - 9x^2 - 27x + 54 < 0$

Let $P(x) = -x^4 + 7x^3 - 9x^2 - 27x + 54$

$= -(x^4 - 7x^3 + 9x^2 + 27x - 54)$

Find when $P(x) = 0$

$P(-2) = 0$

-2	1	-7	9	27	-54
		-2	18	-54	54
	1	-9	27	-27	0 R

$g(x) \therefore g(3) = 0$

3	1	-9	27	-27
		3	-18	27
	1	-6	9	0 R

$P(x) = -(x+2)(x^3 - 9x^2 + 27x - 27)$

$= -(x+2)(x-3)(x^2 - 6x + 9)$

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

$P(x) = -(x+2)(x-3)^3$

Zeros: $-2, 3$

Order: $1, 3$

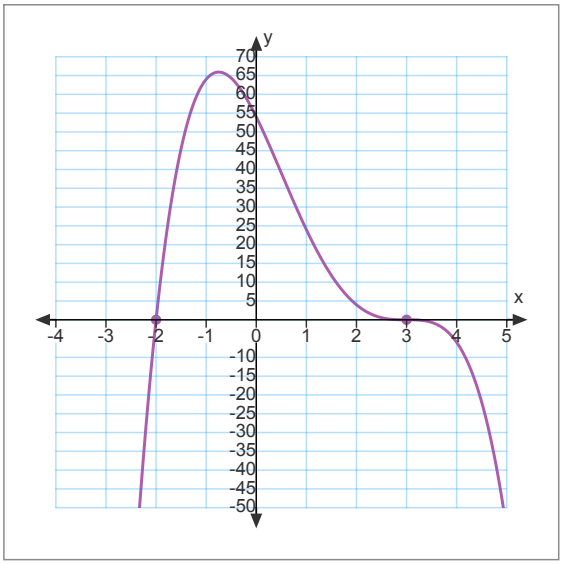
$-(x+2)(x-3)^3 < 0$

$x < -2$	$-2 < x < 3$	$x > 3$
$-(-)(-)$	$-(+)(-)$	$-(+)(+)$
$= -$	$+$	$-$
Yes!	NO!	Yes!

$\therefore (-\infty, -2) \cup (3, \infty)$

$y = x^4 - 5x^3 + 4x^2 + 17x - 40$

$y = 2x^3 - 5x^2 - 10x + 14$



$y = -x^4 + 7x^3 - 9x^2 - 27x + 54$

$y =$

Last Day's Work:

Entertainment: Use a chart to organize your solution instead ofa "number line strategy".
pp. 225-228 #1ab, 2, 5, 6*, 7abc, Challenge #17

Error in answer for 6e. The answer should be: $x \leq \frac{-3}{2}$ or $x \geq 3$

p. 225 **1.** Solve each of the following using a number line strategy. Express your answers using set notation.

a) $(x+2)(x-3)(x+1) \geq 0$

b) $-2(x-2)(x-4)(x+3) < 0$

$x = 2, 4, -3$

$x<-3$	$-3<x<2$	$2<x<4$	$x>4$
$-(-)(-)(-)$	$-(-)(-)(+)$	$-(+)(-)(+)$	$-(+)(+)(+)$
$+$	$-$	$+$	$-$
No	Yes	No	Yes

$\therefore (-3,2) \cup (4,\infty)$

$\{x \in \mathbb{R} \mid -3 < x < 2 \text{ or } x > 4\}$

p. 227 **7.** Solve the following inequalities algebraically. Confirm your answer with a graph.

a) $x^2 - 6x + 9 \geq 16$

b) $x^4 - 8x < 0$

b) $x^4 - 8x < 0$

$x(x^3 - 8) < 0$

$x(x-2)(x^2+2x+4) < 0$

∴ Zeros: 0, 2

order: 1, 1

$x<0$	$0<x<2$	$x>2$
$(-)(-)(+)$	$(+)(-)(+)$	$(+)(+)(+)$
$= +$	$= -$	$= +$
NO	Yes	NO.

∴ $(0,2)$

or $\{x \in \mathbb{R} \mid 0 < x < 2\}$