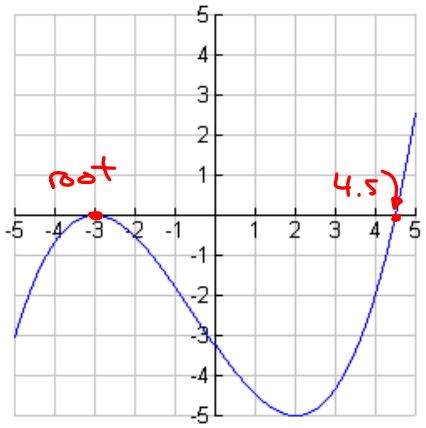
4.3 Solving Polynomial Inequalities

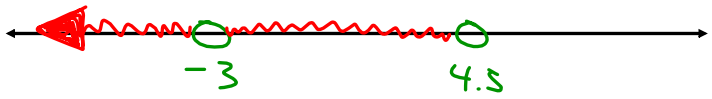
Using interval notation state the solution to f(x) < 0



$f(x) < 0$ on...

$x \in (-\infty, -3) \cup (-3, 4.5)$

@ $x = -3$, $f(x) = 0$



To solve a polynomial inequality...

First - get zero on one side

Second - factor to find zeroes

Third - now you can choose a strategy

Example: Solve $x^3 - 2x^2 - 5x < -6$

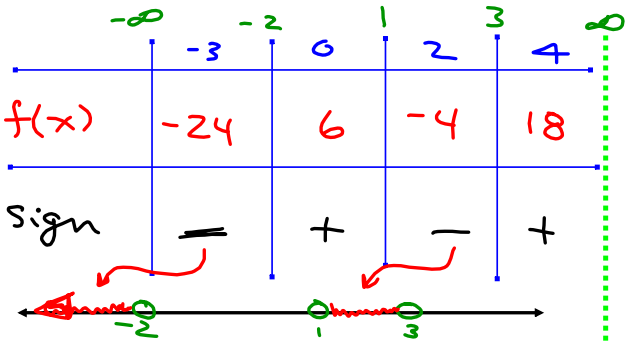
1st - $x^3 - 2x^2 - 5x + 6 < 0$

2nd - $(x+2)(x-1)(x-3) < 0$

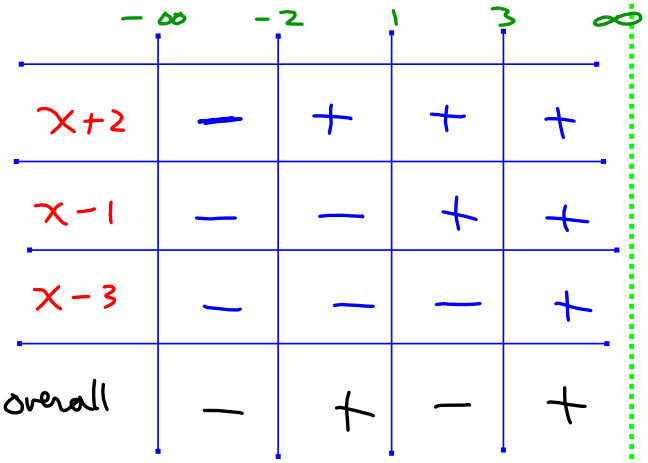
zeroes @ $x = -2, 1, 3$

3rd - now choose a strategy

Test point strategy



Factor table strategy



$x \in (-\infty, -2) \cup (1, 3)$

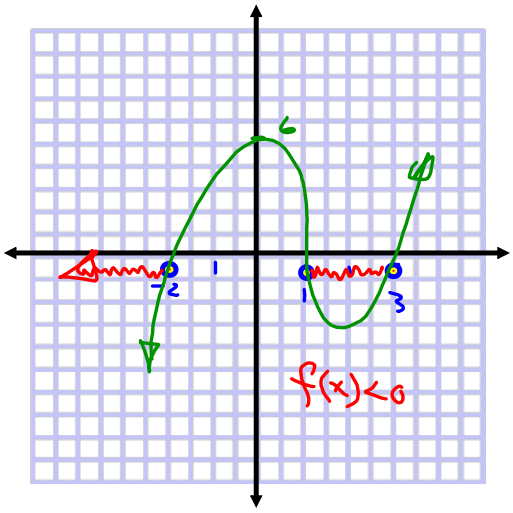
Graphing Strategy

$y = (x+2)(x-1)(x-3)$

y-int = 6

$f(x) < 0$ for ...

$x \in (-\infty, -2) \cup (1, 3)$



Example 2: Let $f(x)=x^3-2x^2+5x+20$ and $g(x)=2x^2+14x-16$

Determine the intervals when f(x) is equal to or greater than g(x)

$f(x) \geq g(x)$

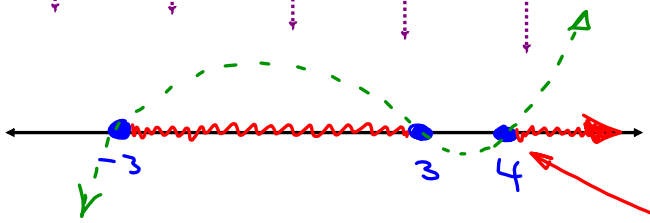
$x^3-2x^2+5x+20 \geq 2x^2+14x-16$

$x^3-4x^2-9x+36 \geq 0$

factor as in chapter 3...

$(x-3)(x+3)(x-4) \geq 0$

	$-\infty$	-4	-3	0	3	3.5	4	5	∞
$x+3$		$-$		$+$		$+$		$+$	
$x-3$		$-$		$-$		$+$		$+$	
$x-4$		$-$		$-$		$-$		$+$	
$f(x)$		$-$		$+$		$-$		$+$	



$f(x) \geq g(x)$ on $x \in [-3,3] \cup [4,\infty)$

closed interval boundaries

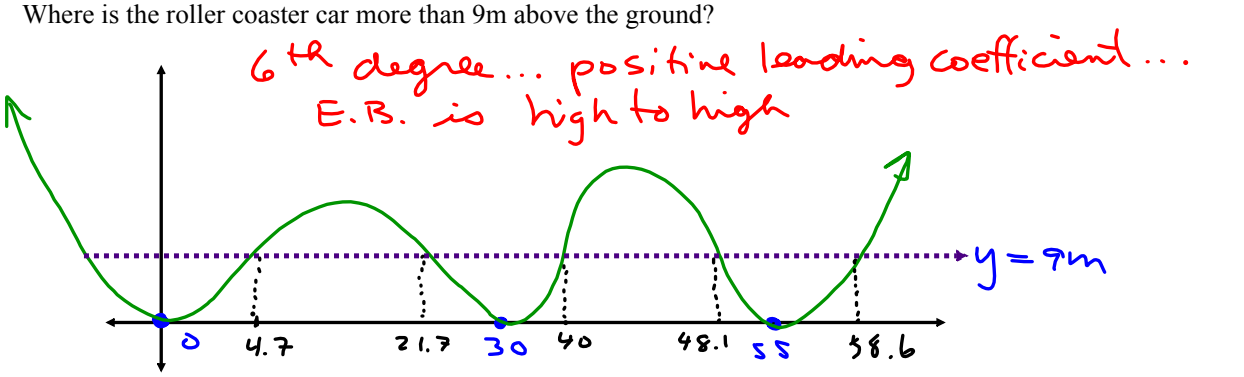
Example 3:

The height of one section of a roller coaster can be described by the polynomial function

$$h(t) = \frac{1}{4000000}x^2(x-30)^2(x-55)^2$$

where h is the height, in metres, and x is the position from the start, measured in metres along the ground.

Where is the roller coaster car more than 9m above the ground?



where is $h(x) > 9$

$\frac{1}{4000000}x^2(x-30)^2(x-55)^2 > 9$

a horrible nightmare that CANNOT be factored w/o a calculator

→ graph $h(x)$ and $y = 9$ ... find intersections

$h(x) > 9$ for $x \in (4.7, 21.7) \cup (40, 48.1) \cup (58.6, \infty)$

Homefun

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