# 4-1 Solving Inequalities

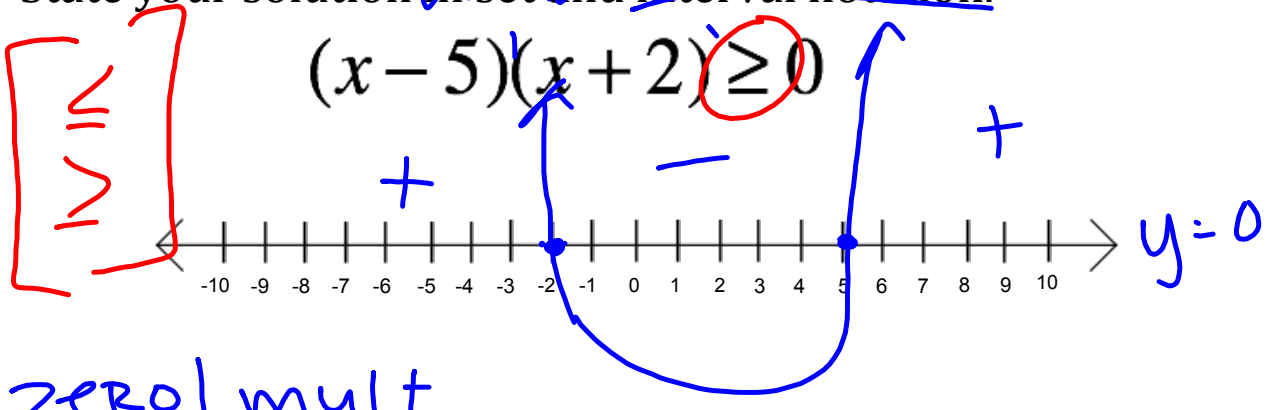
Objective: Students can solve polynomial inequalities.

1. EB
2. ZEROS
3. Multiplicity

Recall from last year.

Solve the following inequalities. Graph your solution.
State your solution in set and interval notation.

$$(x-5)(x+2)\geq 0$$




| ZERO | mult |
|---|---|
| 5 | 1 STR |
| -2 | 1 STR |

EB: $x^2$

$(-\infty, -2] \cup [5, \infty)$

## Solving Inequalities for Polynomials

1. Find Boundary Points (ZEROS)

2. Find Solution Intervals ( $<$ $>$ ) [ $\leq$ $\geq$ ]

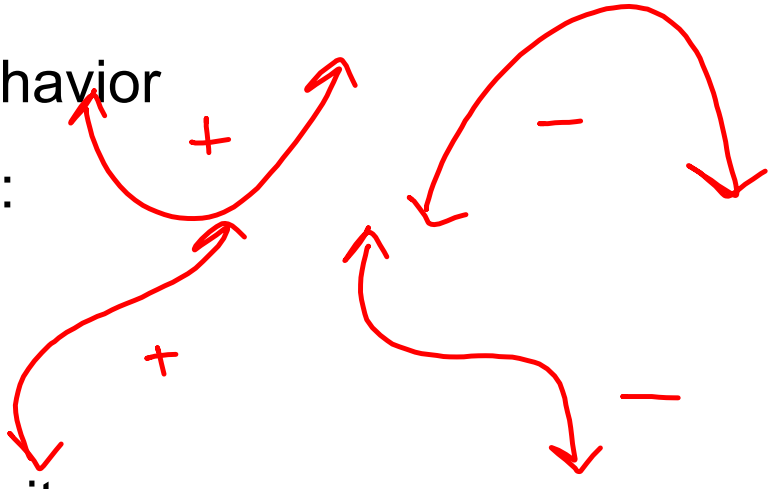
Make a sign chart to be more efficient and use multiplicity rules and end behavior models.

## Key concepts

End behavior

Even:

Odd:

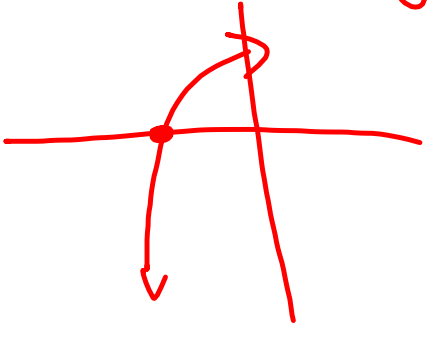


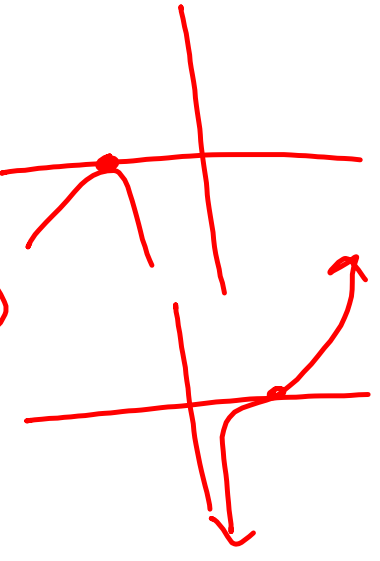

Multiplicity

Even Tangent (Bounce)

Odd > 1 Inflection (SLIDE)

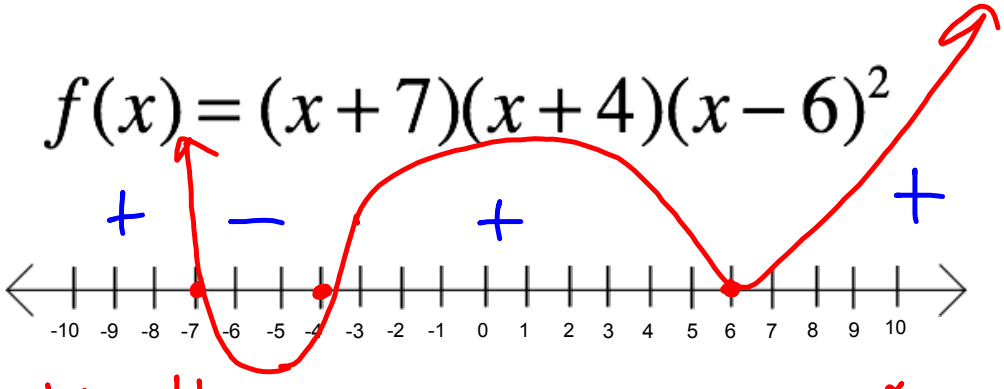
ONE = STRAIGHT





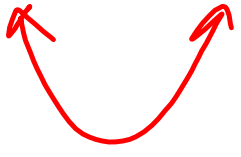
Determine the x-values that cause the polynomial to be a)zero b)positive c)negative

$$f(x)=(x+7)(x+4)(x-6)^2$$




| ZERO | Mult |
|---|---|
| -4 | 1 STR |
| -7 | 1 STR |
| 6 | 2 TanB |

EB: $x^4$



a) $x=-4,-7,6$

b) $(-\infty,-7)\cup(-4,6)\cup(6,\infty)$

c) $(-7,-4)$

Solve the Polynomial Inequality

$$x^3 - 4x^2 - x + 4 \leq 0$$

$x^2(x-4) - 1(x-4)$

$a = x$
$b = 1$

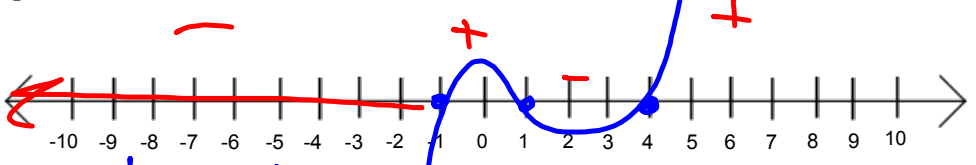
$(x^2 - 1)(x-4)$

$a^2 - b^2$

$(x+1)(x-1)(x-4)$

$(-\infty, -1] \cup [1, 4]$

Sign chart

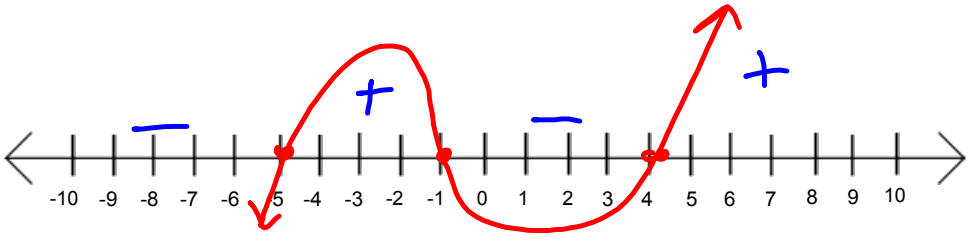



| ZERO | MULT |
|---|---|
| 4 | 1 |
| -1 | 1 |
| 1 | 1 |

$x^3$

# Solve the Polynomial Inequality

$$x^3 + 2x^2 - 19x - 20 > 0$$




POSSIBLE: $\pm 1, \pm 2, \pm 4, \pm 5, \pm 10, \pm 20$

$$\begin{array}{r|rrrr} -1 & 1 & 2 & -19 & -20 \\ & & -1 & -1 & 20 \\ \hline & 1 & 1 & -20 & 0 \end{array}$$

$1x^2 + 1x - 20$

$(x-4)(x+5)(x+1)$

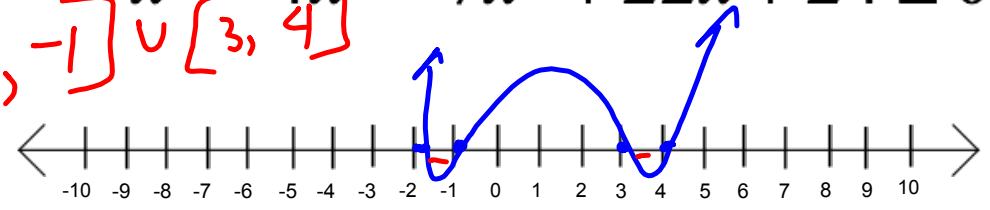
| ZERO | MULT |
|---|---|
| $-1$ | 1 STR |
| $-5$ | 1 STR |
| $4$ | 1 STR |

$(-5, -1) \cup (4, \infty)$

# Solve the Polynomial Inequality

$$x^4 - 4x^3 - 7x^2 + 22x + 24 \leq 0$$

$[-2, -1] \cup [3, 4]$




| | | | | | |
|---|---|---|---|---|---|
| -1 | 1 | -4 | -7 | 22 | 24 |
| | | -1 | 5 | 2 | -24 |
| | 1 | $x^3$ | $-5x^2$ | $-2x$ | 24 |
| -2 | | | -2 | 14 | -24 |
| | 1 | $x^2$ | $-7x$ | $+12$ | 0 |

$$(x+2)(x+1)(x-4)(x-3)$$

| z | M |
|---|---|
| -2 | 1 ST |
| -1 | 1 ST |
| 4 | 1 ST |
| 3 | 1 ST |

## Check for understanding:

1. Find where the polynomial is zero, positive, or negative

$$f(x) = (x+3)(x+1)^2(x-4)^2$$