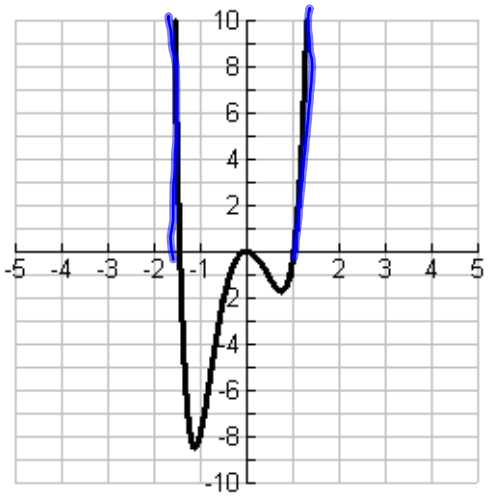
2.8 Solving Inequalities in One Variable

when solving an inequality - your answer is the x values for where the function (y values) meets the given conditions

$f(x) > 0$

report the x values for where the y's are greater than zero

$(-\infty, -1.5) \cup (1, \infty)$



A full graph is not needed to do this so we use a sign chart.

(A sign chart shows only the items related to the signs of the function.)

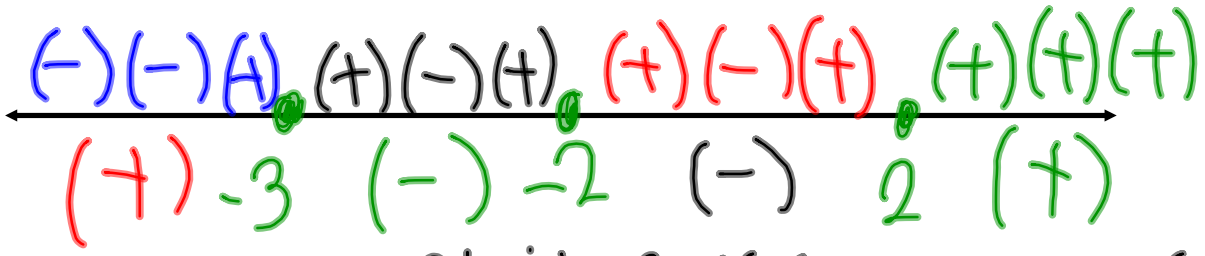
What are the important items in a graph?

X-intercepts

$(x+3)(x-2)(x+2)^2 \geq 0$

$-3 \quad 2 \quad -2$

$(-\infty, -3] \cup [2, \infty)$



✓ $-3 : m = 1$ Straight crosses : sign changes

✓ $-2 : m = 2$ Tangent : doesn't : no sign change

✓ $2 : m : 1$ ⟶

Polynomial Inequalities

goal: solving where the polynomial is (+) or (-)

Everything on 1 side and factored

Find all x-intercepts

Plot using open & closed holes according to the inequality sign

Find the signs of the graph in the intervals b/w the intercepts (use a value in the interval)

Answer: the intervals according to the inequality signs (use the union symbol if more than 1 interval)

$-(x^2+3)(x-5)^2 < 0$

5

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

(-)(+)(+) 0 (-)(+)(+)

(-) 5 (-)

$(x-3)(x+4)^2(x-1)^3 \geq 0$

3 -4 1

$(-\infty, 1] \cup [3, \infty)$

$(-\infty, -4) \cup (-4, 1) \cup (3, \infty)$

no change | sign change | yes sign change

+ + − +

-4 1 3

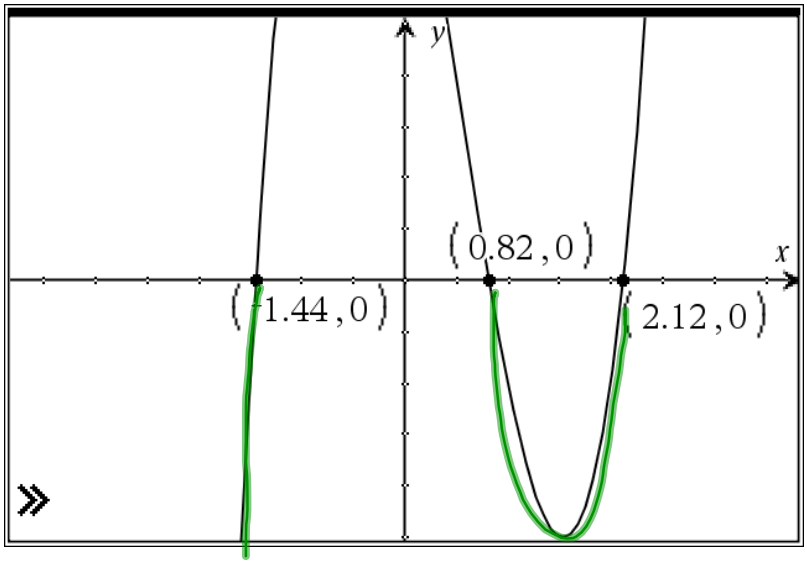
Degree: 6 → Even

LC: +

Solve the polynomial inequality graphically.

$$2x^3 - 3x^2 - 5x + 5 < 0$$

When asked to solve graphically - use your calculator to find the x-intercepts - then give the appropriate intervals based on the question.



$(-\infty, -1.44) \cup (0.82, 2.12)$

2nd, calc, zero

Making Sign Chart for a Rational Function

$$\frac{(2x+1)}{(x+3)(x-1)}$$

$(2x+1)$ → X-int.

$(x+3)(x-1)$ → V.A

Include X-int & V.A.

Rational Inequalities #33

goal: to find where the graph is (+) or (-) depending on the inequality sign (remember to flip sign if multiply or divide by (-)

1. Get everything on one side and zero on the other
2. find LCD
3. Simplify the "everything" side into 1 fraction (not clearing fractions)
4. find x-intercepts - plot with open or closed holes depending on inequality signs
5. find restrictions (VA) - plot with open holes on line or if cross off undefined interval
6. use test point in intervals to find signs
7. Write answer in interval notation

$$\frac{x-2}{x} < \frac{x-4}{x-6}$$

$$-\frac{x-4}{x-6} \quad -\frac{x-4}{x-6}$$

LCD: $x(x-6)$

$$\frac{(x-6)}{(x-6)}\frac{x-2}{x} - \frac{x-4(x)}{x-6(x)} \; 0$$

$$\frac{(x-6)(x-2)}{x(x-6)} - \frac{x(x-4)}{x(x-6)} < 0$$

$$\frac{x^2-8x+12-x^2+4x}{x(x-6)} < 0$$

$$\frac{-4x+12}{x(x-6)} < 0$$

$$\frac{x-5}{(2x-3)(x+2)} \geq 0$$

≥ 5

$3/2 \quad -2$

$$\frac{(-)}{(-)(-)} \quad \frac{(-)}{(-)(+)} \quad \frac{(-)}{(+)(+)} \quad \frac{(+)}{(+)(+)}$$

$$(-) \quad -2 \quad (+) \quad 3/2 \quad (-) \quad 5 \quad (+)$$

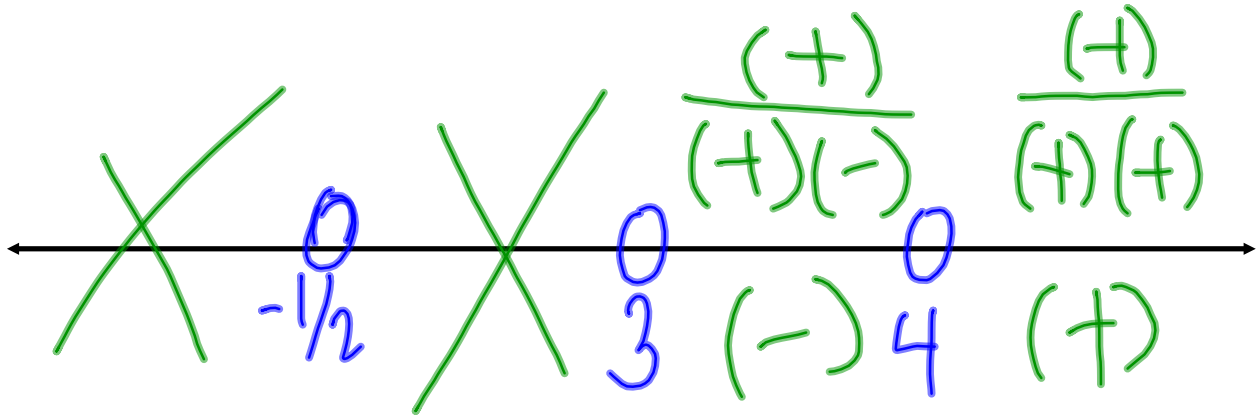
$$[-2, 3/2] \cup [5, \infty)$$

$$\frac{\sqrt{x-3}}{(2x+1)(x-4)} < 0$$

3

$-1/2$ 4

$(3,4)$



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