Solving Quadratic and Rational Inequalities:

1. Get everything on the left side of the inequality, zero on the right.
   a) If it's a polynomial fraction, get everything over a common denominator and simplify.
2. Find the **zeros** and where the denominator (if applicable) is zero.
   a) Graph those points on a number line, using solid dots for $\leq$ & $\geq$ and open circles for $<$ & $>$ & zero denominator values.
3. **Choose** a point **in each interval** on your number line.
4. **Test** that chosen point. Only evaluate whether the test point is + or –, not the actual value of the point.
4. Write your **answer** in interval notation using the number line and the test values.
   a) Only write the + intervals if the original problem was $>$ or ≥ 0
   b) Only write the – intervals if the original problem was $<$ or ≤ 0

Example: $\frac{x+2}{2x-4} \geq 1$ ← first get zero on the left, then a single common fraction.

$$\frac{\boldsymbol{x+2}}{\boldsymbol{2x-4}} \geq \mathbf{1} \rightarrow \frac{x+2}{2x-4} - 1 \geq 0 \rightarrow \frac{x+2}{2x-4} - 1\left(\frac{2x-4}{2x-4}\right) \geq 0$$

$$\frac{x+2-(2x-4)}{2x-4} \geq 0 \rightarrow \frac{\boldsymbol{-x+6}}{\boldsymbol{2x-4}} \geq \mathbf{0}$$

So, now we have: $\frac{-x+6}{2x-4} \geq 0$

Zeros: 2 6

Choose: **0** **+3** **+7**

Test: – + –

Test chosen points:

$$\frac{-0+6}{2(0)-4} = -$$

$$\frac{-3+6}{2(3)-4} = +$$

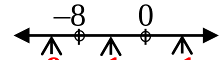
$$\frac{-7+6}{2(7)-4} = -$$

Answer: (2,6] ← since the original problem was ≥, we look for the +'s on our test.

Example: $x^3 + 8x^2 < 0$

$x^2(x+8) < 0$

Zeros: –8 0



Choose: **–9** **–1** **+1**

Test: – + +

Test chosen points:

$(-9)^2(-9+8) = +81(-1) = -$

$(-1)^2(-1+8) = +1(+7) = +$

$(+1)^2(+1+8) = +1(+9) = +$

Answer: $(-\infty,-8)$ ← since the original problem was <, look for the –'s on the test.