Def: any inequality involving a polynomial on one or both sides of the inequality symbol is called a **polynomial inequality.**

Ex: What do these polynomial inequalities mean? Look at the graph, and think about this question again.

$$a) x^{2}-3x-28\geq 0 \& b)-x^{2}+1<0$$

The solution set for a) is the set of all x values that makes the inequality true. So consider the graph.

This is a parabola facing up with x-intercepts at $\left(7,0\right) \& (-4,0)$. Since it faces up everything between $x=-4 and x=7$ will have a y value less than 0, so then everything above $x=7 $and below $x=-4$ will have a y value that is greater than 0.

Sketch graph on a number line laid over the graph of the function. Show the solution set.

Same goes for b)

Ex: Find the solution set for the inequalities $a) 5x^{3}+10x^{2}-15x>0 \& b) 4x^{3}-4x\leq 0$

Show roots, then show how to test the intervals to show if the function is pos or neg. Sketch the function under a number line, then show the solution set.

$$a) 5x\left(x+3\right)\left(x-1\right)>0 \& b) 4x\left(x+1\right)\left(x-1\right)\leq 0$$

Ex: Solve the Rational Inequality $\frac{x+5}{x-3}\geq 3$

Solution:

 So for the inequality lets test the intervals: $\frac{x+5}{x-3}\geq 3$

A: $(-\infty ,3)$, Pick the easy value of $x=0.$

Is $\frac{5}{-3}\geq 3?$ no, so x=0 is not a solution

B: $(3,7)$, Pick the value of $x=4$

$\frac{4+5}{4-3}=\frac{9}{1}=9\geq 3?$ Yes, so $x=4$ is one of many solutions in this solution set.

C: $(7,\infty )$, pick an easy number to plug in; perhaps $x=13$

$\frac{13+5}{13-3}=\frac{18}{10}=1.8\geq 3?$ N0, so $(7,\infty )$ is not in the solution set.