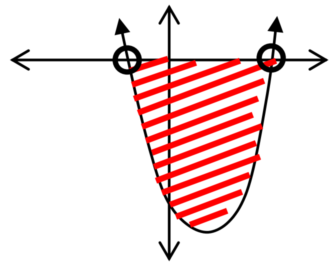
Section 2.7 (Polynomial and Rational Inequalities)

- Just as we can solve <u>linear</u> inequalities in one variable ($x < 4$, $2x + 1 > 5$, etc) we can also solve <u>polynomial</u> inequalities in one variable
- Consider the graph of $x^2 - 3x - 10 < 0$
  - Looking along the x-axis, where do we fall less than 0?
  - What points separate the regions?
  - Finding these points (intercepts) and choosing test points from the number line will allow us to solve the inequality



<u>Example</u>: Solve $(x - 2)(x + 4) > 0$

- Solving a polynomial inequality
  - Write inequality in standard form and solve related equation (find ***boundary points***)
  - Separate number line into regions with those boundary points
  - For each region, choose ***test point*** and determine if the value satisfies the original inequality
    - If test point in a region is true, then all points in that region will be true
  - Solution set includes the regions whose test points provide solutions (the original solutions are not part of the solution set if < or > is the inequality – only when ≤ or ≥)

<u>Example</u>: Solve the following (if inequality is true in a region, is it always false in regions on either side?)

$x^2 - 6x \le 0$ $\qquad$ $x^2 - x > 20$ $\qquad$ $x^3 + 3x^2 \le x + 3$

- Solving rational inequalities is similar except that you also solve and test around values that make the denominator 0 (note that the solution set will NOT include these points)

Book problems: 5,13,25,27,31,37,39,45,53,58

Example: Solve and graph the solution set of the following

$$\frac{x-3}{x+5} \le 0 \qquad\qquad \frac{2x}{x+1} \ge 1$$

An object that is falling or vertically projected into the air has its height above the ground, s(t), in feet, given by $s(t) = -16t^2 + v_0t + s_0$ where t is the time that the object is in motion (in seconds), v_0 is the original velocity (initial velocity) of the object (in feet per second), and s_0 is the original height (initial height) of the object (in feet).

Example: The Hokie bird recently threw a football upward off the top of Lane Stadium (190 feet high – maybe) with an initial velocity of 96 feet per second. When will the ball hit the ground? During which time period will the height of that ball exceed the height of the stadium?