MATH 1314 – COLLEGE ALGEBRA
SECTION 2.7 LINEAR INEQUALITIES AND ABSOLUTE VALUE INEQUALITIES

- Properties of Inequalities:
  - Trichotomy Property: For all real numbers a and b, one of the following statements is true:
  - Transitive Property: If a, b, and c are real numbers, then
    if $a < b$ and $b < c$, then

    if $a > b$ and $b > c$, then
  - Addition/Subtraction Properties: Let a, b, and c be real numbers.
    - If $a < b$, then $a + c <$
    - If $a < b$, then $a - c <$
    - Similarly for $\leq, \geq, >$
  - Multiplication/Division Properties: Let a, b, and c be real numbers.
    1. If $a < b$ and $c > 0$, then $ca <$
       If $a < b$ and $c > 0$, then $\frac{a}{c} <$
    2. If $a < b$ and $c < 0$, then $ca >$
       If $a < b$ and $c < 0$, then $\frac{a}{c} >$

    NOTE: If we multiply or divide by a negative number,

- We will solve quadratic and absolute value functions analytically and graphically.
  Ex: Let $f(x) = 3x - 1$ and $g(x) = 2$.

  (a) Solve $f(x) = g(x)$. (b) Solve $f(x) > g(x)$. (c) Solve $f(x) < g(x)$.

  (d) Graph both functions and verify the solutions to the parts above.

- Solving Linear Inequalities:

  Ex: Solve $5(x-4) > 25$.

  Ex: Solve $-4(x+3) \geq 16$.

- Compound Inequalities:

  Ex: Solve $-5 \leq 2x+1 < 9$

  Ex: Solve $x+1 < 2x-3 \leq 3x-5$.

- Recap: For linear inequalities, we solve like an equation.
- For nonlinear inequalities:
  1. Arrange the inequality so that you are comparing an expression to zero.
  2. Replace the inequality sign with an = sign.
  3. Solve like an equation.
  4. Test intervals on a number line.
- Rational Inequalities: Remember to arrange the inequality so that you are comparing an expression to zero. Set numerator=0 and solve. Set denominator=0 and solve. Test each interval on a number line.
  Ex: Solve $\frac{x-1}{x+5} \geq 0$

- Recall: $|x|$ means

  Ex: Solve $|x| < 6$. Verify the solutions graphically.

  Ex: Solve $|2x-3| \leq 5$. Verify the solutions graphically.

Ex: Solve $5|4x-1| > 30$. Verify the solutions graphically.

Ex: Solve $3 < |2x-3| \leq 5$. Verify the solutions graphically.