Math 1050 ~ College Algebra

11 Polynomial Inequalities

$-3x + 4y = 5$
$2x - y = -10$

$\begin{bmatrix} -3 & 4 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ -10 \end{bmatrix}$

$\sum_{k=1}^{m} k = \dfrac{m(m+1)}{2}$

$\sum_{k=0}^{n} z^k = \dfrac{1 - z^{n+1}}{1 - z}$

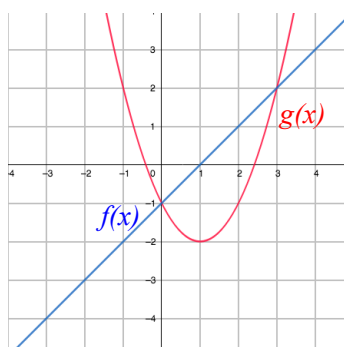| **Learning Objectives** |
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| • Solve polynomial inequalities graphically. |
| • Solve polynomial inequalities analytically. |

Graphical Interpretations of Equations and Inequalities

Ex 1: Given this graph of f(x) and g(x), determine the values of x for which each of these is true.

a) $f(x) = g(x)$

b) $f(x) < g(x)$

c) $f(x) > g(x)$

Analytical Solution of Polynomial Inequalities

Ex 2: Given $f(x) = x^2 - 4$ and $g(x) = x + 2$, determine the values of x for which each of these is true by doing the math.

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

As the functions get more complicated, it is convenient to use a **sign line** to sort it out.

Directions for Using a Sign Line

a) Write the inequality as a function, f, with zero on the right side.

b) Determine the zeros of f and place them on a number line.

c) Choose a test value in each of the intervals on the number line.

d) Determine the sign of f for each test value, writing that sign above that interval.

e) Your solution is the interval(s) that correspond to the inequality.

Ex 3: Follow the steps above to solve these inequalities.

a) $x^2 + 2x > 3$ b) $-3x^2 - 2x \geq -x^2 + x - 2$

Ex 4: Solve this inequality by each method.

a) Graphically $(x-1)^2 - 2 > -x^2 + 3$ b) Analytically $(x-1)^2 - 2 > -x^2 + 3$