Notes 2.8 pre-calc

Solving Inequalities in One Variable

Polynomial Inequalities: Every polynomial inequality can be written in the form $f(x) > 0$, $f(x) \geq 0$, $f(x) < 0$, $f(x) \leq 0$ where $f(x)$ is a polynomial. There is a fundamental connection between inequalities and the positive or negative sign of the corresponding expression $f(x)$:

1. To solve the inequality $f(x) > 0$ is to find the values of x that make $f(x)$ positive.
2. To solve the inequality $f(x) < 0$ is to find the values of x that make $f(x)$ negative.
3. If the expression $f(x)$ is a product, determine its sign by determining the sign of each of its factors.

Note: To sketch a graph of a polynomial use end behavior, multiplicity of real zeros, and a chart of signs.

Examples: Determine the x values that cause the polynomial to be zero, positive and negative.

a) $f(x) = (x - 7)(3x + 1)(x + 4)$

b) $f(x) = (x + 2)^3(4x^2 + 1)(x - 9)^4$

Solve the polynomial inequality using a sign chart. Support graphically.

$$(2x+1)(x-2)(3x-4) \leq 0$$

$$x^3 - 4x^2 + x + 6 \geq 0$$

$$(3-2x)^2(x^2+4) \leq 0$$

$$(3-2x)^2(x^2+4) \geq 0$$

$$(3-2x)^2(x^2+4) < 0$$

$$(3-2x)^2(x^2+4) > 0$$

Determine the x values that cause the function to be zero, undefined, positive and negative

$$\frac{x^2-4}{x^2+4} \qquad \frac{x+2}{x^2-9} \qquad \frac{x^2+3x-10}{x^2-6x+9}$$

Solve the inequality using a sign chart.

$$\frac{x^2-4}{x^2+4} \leq 0 \qquad \frac{x+2}{x^2-9} \geq 0 \qquad \frac{x^2+3x-10}{x^2-6x+9} < 0$$