Section 3.4 Solve Rational Equations and Inequalities

To solve rational equations algebraically

- Factor the expressions in the numerator and denominator to find asymptotes and restrictions.
- Multiply both sides by the factored denominators, and simplify to obtain a polynomial equation. Then, solve using techniques you learned in unit 2.

Example: Solve algebraically. Check your solution(s) for a) and b).

a) $\frac{4}{3x-5} = 4$

b) $\frac{3x}{3x+2} - \frac{2x}{3x-2} = 1$

c) $\frac{x-5}{x^2-3x-4} = \frac{3x+2}{x^2-1}$

For rational inequalities:

- It can often help to rewrite with the right side equal to zero. Then, use test points to determine the sign of the expression in each interval.

- If there is a restriction on the variable, you may have to consider more than one case. For example, if $\frac{a}{x-k} < b$ case 1 is x > k and case 2 is x < k.

- Tables and number lines can help organize intervals and provide visual clue to solutions.

- The **critical values of x** are those values where there is a vertical asymptote, or where the slope of the graph of the inequality changes sign.

Example: Solve the following inequalities. Illustrate the solutions on a number line.

a) $\frac{2}{x-5} < 10$

b) $\frac{x^2-x-2}{x^2+x-12} \geq 0$