

## Section 5.5

### Polynomial and Rational Inequalities

### SOLVING A POLYNOMIAL OR RATIONAL INEQUALITY

**Step 1:** Write the inequality so that the polynomial or rational expression  $f$  is on the left side and zero is on the right side in one of the following forms:

$$f(x) > 0 \quad f(x) \geq 0$$

$$f(x) < 0 \quad f(x) \leq 0$$

For rational expressions, be sure that the left side is written as a single quotient and find its domain.

### SOLVING (CONTINUED)

**Step 2:** Determine the real numbers at which the expression  $f$  on the left side is equal to zero, and, if the expression is rational, the real numbers at which the expression  $f$  on the left side is undefined.

**Step 3:** Use the numbers from Step 2 to separate the real number into intervals.

### SOLVING (CONCLUDED)

**Step 4:** Select a number in each interval and evaluate  $f$  at that number.

- (a) If the value of  $f$  is positive, then  $f(x) > 0$  for all numbers  $x$  in the interval.
- (b) If the value of  $f$  is negative, then  $f(x) < 0$  for all numbers  $x$  in the interval.

If the inequality is not strict, include the solutions of  $f(x) = 0$  in the solution set. Be careful to exclude values of  $x$  where  $f$  is undefined.

### TEST VALUES

The numbers selected in Step 4 are called **test values** because they are used to test whether the function is positive or negative in the interval.

The preceding method is sometimes called the **test-value method** for solving inequalities.