10.3: Multiplying and Dividing Rational Expressions

A common mistake when working with rational expressions is dividing out too frequently, i.e. simplifying when simplification is not really possible.

Example: Simplifying fractions

$\frac{6}{15} = \frac{3 \bullet 2}{3 \bullet 5} = \frac{2}{5}$ (3 is a FACTOR of the numerator and of the denominator and can be divided out, yet preserve the numeric value of the fraction.)

BUT $\frac{6}{15} = \frac{5+1}{5+10} \neq \frac{1}{10}$ (5 is NOT a FACTOR of the numerator, but an addend. Therefore, it cannot be divided out and preserve the numeric value of the fraction.)

Similarly, $\frac{x(x+1)}{(x+1)(x+2)} = \frac{x}{x+2}$ (x+1 is a FACTOR of the numerator and denominator and can be divided out just like the 3 above.)

HOWEVER, $\frac{x+1}{x+2} \neq \frac{1}{2}$ (The x's cannot be divided out of the numerator and denominators because the x's are not factors, just as the 5's weren't factors in the example above.)

There are seven excellent examples on pages 533-536. Study and practice them before attempting the assignment.

Assignment 10.3: #7,11,15,19,23,29,35,39

10.4: Solving Rational Equations

Before solving these equations, take a few moments to determine for which values the equation is undefined, i.e. the values which will make the denominator zero. If the solutions occur in your final answer, then they are extraneous. An extraneous solution is an invalid solution which we obtain by valid solving methods.

Because these are <u>equations</u>, you are allowed to multiply both sides of the equation by a value and preserve equality. Because of this fact, you can multiply out the denominators (using the least common denominator) and then work with simpler polynomial equations. See Examples 2-6 on pages 541-543.

Assignment 10.4: #5-13 odd, 17,19,23,27,29,35,37,43

10.5: Addition, Subtraction, and Complex Fractions

Be careful not to confuse this section with Section 10.4. In the previous section, you were solving for values of x. In this section, there are <u>no</u> equations, only expressions to simplify. Therefore, you should not end up with any x=? statements. Study Example 1 on page 548 very carefully.

Examples 2 and 3 offer two different methods for simplifying complex fractions. In Example 2, the numerator and the denominator are combined into single fractions, and then rational division (multiply the numerator by the reciprocal of the denominator) is completed. In Example 3, the numerator and denominator are both multiplied by the least common denominator of all the "little" fractions. This is the same as multiplying the fraction by 1, which does not change the fraction's value. Either method is completely acceptable.

Following is Example 2 simplified using the Example 3 method.

$$\frac{\frac{x}{4}+\frac{3}{2}}{2-\frac{3}{x}} \qquad \text{LCD: } 4x$$

$$\left(\frac{\frac{x}{4}+\frac{3}{2}}{2-\frac{3}{x}}\right)\left(\frac{4x}{4x}\right)=\frac{x^2+6x}{8x-12}=\frac{x(x+6)}{4(2x-3)}$$

Distribute here!

Assignment 10.5: #5,7,9,13,17,21,25,29,35,37
Note: For #35 and 37, you will actually find values for x.

OMIT Section 10.6.

Quiz #10 should be taken at the completion of Chapter 10.