PCFU: Solving Rational Equations (E11) Name: ___________________________________

CP

Solutions and explanations for the progress check:

1. $\frac{4}{3x+3} = \frac{12}{x^2-1}$	The first thing I needed to do was to factor both denominators so that I could find restrictions and so I could look for the least common denominator.
$3x+3=3(x+1)$ $x^2-1=(x+1)(x-1)$	The first denominator had a common factor of 3 so I factored that from both terms. The second denominator was the difference of two squares which always factors as $a^2-b^2=(a+b)(a-b)$
Restrictions: $x \neq -1, 1$	I found the restrictions by setting each factor in the denominator equal to zero then solving.
LCD: $3(x+1)(x-1)$	I found the LCD by starting with the denominator 3(x+1) and then looking at the factors of the second denominator. I saw that I already had the (x+1) so all I needed to include that wasn't already there was the factor (x-1).
$\frac{4 \cdot 3(x+1)(x-1)}{3(x+1)} = \frac{12 \cdot 3(x+1)(x-1)}{(x-1)(x+1)}$	I multiplied each numerator by the LCD so that I could divide to get rid of fractions. I reduced on the left by dividing the 3 and (x+1). I reduced on the right by dividing (x+1)(x-1).
$4(x-1)=12 \cdot 3$	To complete the solving, I distributed the 4 through the parentheses.
$4x-4=36$	I added 4 to both sides.
$4x=40$	I divided both sides by 4.
$x=10$	This is not an extraneous solution. That is, it is not a false answer given by the steps I used. The only restrictions on x are x≠1 and x≠-1.

2. $\frac{4}{x} + \frac{3}{4} = 1$	In this problem I noticed that the denominators were relatively prime. That is, the denominator of x and the denominator of 4 had no common factors. This made it easy for me to find the LCD because all I had to do was multiply them together.
LCD: $4 \cdot x = 4x$ Restrictions: $x \neq 0$	The restrictions only come from the denominators. In this problem the only possible restriction comes from the denominator with x.
$\frac{4 \cdot 4x}{x} + \frac{3 \cdot 4x}{4} = 1 \cdot 4x$	To eliminate fractions altogether, I multiplied each numerator by the LCD of 4x.
$4 \cdot 4 + 3 \cdot x = 4x$	I reduced the first fraction by dividing the x. I reduced the second by dividing the 4.
$16+3x=4x$	To finish solving I needed to get the x terms on the same side of the equation so I subtracted 3x from both sides.
$16=x$	The only restriction was that x≠0, so this is not an extraneous solution.

Additional Practice

1. Factor each expression.
   a) $x^2 - 9$
   b) $6x^2 + 18x$
   c) $x^2 + 6x + 9$

2. Use your work from above to find the restrictions on the domain of the following rational expressions.
   a) $\frac{x}{x^2-9}$
   b) $\frac{x-3}{6x^2+18x}$
   c) $\frac{-1}{x^2+6x+9}$

3. Use your work from above to find the LCD for the following rational expressions.
   $\frac{x}{x^2-9}$ and $\frac{x-3}{6x^2+18x}$ and $\frac{-1}{x^2+6x+9}$

   LCD:

4. Solve the following rational equations. State your restrictions and the LCD/LCM. Check for extraneous solutions.
   a) $\frac{1}{x} + \frac{1}{x^2} = 2$
   b) $\frac{2x-1}{x+1} = \frac{2x-2}{x}$

5. Maria solved an equation with rational expressions in math class. Her partner told her that when she checked the answer key there was no solution. Below is Maria's work. Explain to Maria why there is no solution for this rational equation.

$$\frac{2}{x+3} + \frac{6}{x^2+3x} = \frac{1}{x}$$

$$\frac{2}{x+3} + \frac{6}{x(x+3)} = \frac{1}{x}$$

$$\frac{2 \cdot x(x+3)}{x+3} + \frac{6 \cdot x(x+3)}{x(x+3)} = \frac{1 \cdot x(x+3)}{x}$$

$$2x + 6 = x + 3$$

$$2x = x - 3$$

$$x = -3$$