

Rational Equation Example

Math 130 Kovitz

Solve for x .

$$\frac{4x}{3} = \frac{x + 14/3}{x + 1}$$

Clear the fractions by cross-multiplying. Then see if the resulting equation is linear or quadratic. If quadratic, decide on a method of solution. Then either isolate the x terms (if completing the square) or set the right side to 0 (if factoring or using the quadratic formula). *Do not* isolate the x terms on one side and divide both sides by the result of factoring out an x . That definitely will not be correct; it is not a linear equation, so methods for solving a linear equation are not applicable.

It is always a good idea to check the solutions in the *original* equation, using a calculator if necessary.

$$4x(x + 1) = 3(x + 14/3) \quad \text{Cross multiply.}$$

$$4x^2 + 4x = 3x + 14 \quad \text{Distribute multiplication over addition.}$$

$$4x^2 + x - 14 = 0 \quad \begin{array}{l} \text{Set the right side of the equation to 0.} \\ \text{Completing the square does not look too promising.} \end{array}$$

$$(4x - 7)(x + 2) \quad \text{Factor by trial and error. There is also a grouping method.}$$

$$x = 7/4 = 1.75 \text{ or } x = -2.$$

$$\text{Alternative solution by quadratic equation: } x = \frac{-1 \pm \sqrt{1 - 4(4)(-14)}}{8} = \frac{-1 \pm 15}{-8}.$$

The answers are $(-14)(-8) = 1.75$ and $(-16)(-8) = 2$, same as before.

Check the answers.

$$\frac{7}{3} = \frac{6.4166667}{2.75}.$$

$$2.33333 = 2.33333$$

and

$$\frac{-8}{3} = \frac{-2 + 14/3}{-1}$$

$$-2.6667 = \frac{2.6667}{-1}$$

Both answers check.