

Solving Rational Equations

Oct 20/2014

Strategies:

- (1) Factor numerators and denominators, looking for any common factors to remove.
- (2) Combine separate fractions using a lowest common denominator.
- (3) Rearrange so one side is zero and the other has a common denominator, then solve the numerator only.

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Ex.1 Solve  $\frac{x^2 - x - 6}{x^2 + x - 12} = 0$

$$\frac{(x-3)(x+2)}{(x+4)(x-3)} = 0$$

$$\frac{x+2}{x+4} = 0, \quad x \neq 3$$

$$(x+4) \frac{x+2}{x+4} = 0 \quad (x+4), \quad x \neq -4$$

$x+2 = 0$   
 $x = -2$

Sub  $x = 3$  into  $\frac{x+2}{x+4} = \frac{5}{7}$

HA:

$$x+4 \overline{) x+2}$$

$$\begin{array}{r} x+4 \\ \underline{x+4} \\ -2 \end{array} \rightarrow R$$

$$\frac{x+2}{x+4} = 1 - \frac{2}{x+4}$$

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Ex.2 Solve  $\frac{x+3}{x-4} = \frac{x-1}{x+2}$

① multiply both sides  
by both denominators

② rearrange to one side  
+ create common  
denominator

③ cross multiply

$$(\cancel{x+2})(\cancel{x-4}) \frac{x+3}{x-4} = \frac{x-1}{x+2} (\cancel{x+2})(x-4)$$

$$(x+2)(x+3) = (x-1)(x-4), x \neq 4, -2$$

$$x^2 + 5x + 6 = x^2 - 5x + 4$$

$$10x = -2$$

$$x = -\frac{1}{5}$$

no  
disagreement

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Ex.3 Solve  $\frac{1}{x} + \frac{1}{x-3} = \frac{1}{2}$

$$\frac{1}{x} + \frac{1}{(x-3)} - \frac{1}{2} = 0 \quad \frac{1}{2} + \frac{1}{3} + \frac{1}{5}$$

$$\frac{1(x-3)(2)}{x(x-3)(2)} + \frac{1(2)(x)}{(x-3)(2)(x)} - \frac{1x(x-3)}{2x(x-3)} = 0$$

$$\frac{2x-6+2x-(x^2-3x)}{2x(x-3)} = 0$$

$$(\cancel{2x})(\cancel{x-3}) \frac{-x^2+7x-6}{2x(\cancel{x-3})} = 0 \quad (2x)(x-3)$$

$$-x^2+7x-6 = 0, x \neq 0, 3$$

$$x^2-7x+6 = 0$$

$$(x-6)(x-1) = 0$$

$$x=6 \text{ or } x=1$$

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Assigned Work:

p.286 # 5ace, 6bcf, 10, 12, 13 (see p.278 for help on 10, 13)

$$5(c) \quad \frac{2x}{x-3} = 1 - \frac{6}{x-3} \quad \text{LCD} = (1)(x-3) \\ = x-3$$

$$\frac{2x}{x-3} - 1 \frac{(x-3)}{(x-3)} + \frac{6}{x-3} = 0$$

$$\frac{2x - x + 3 + 6}{x-3} = 0 \quad [x(x-3)]$$

$$x + 9 = 0 \quad x \neq 3$$

$$x = -9$$

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$$6(b) \quad \frac{3}{x} + \frac{4}{x+1} = 2$$

$$\frac{3(x+1)}{x(x+1)} + \frac{4x}{x(x+1)} - \frac{2x(x+1)}{x(x+1)} = 0$$

$$\cancel{x(x+1)} \frac{3x+3+4x-2x^2-2x}{\cancel{x(x+1)}} = 0 \quad [x x(x+1)]$$

$$-2x^2 + 5x + 3 = 0, \quad x \neq 0, -1$$

$$2x^2 - 5x - 3 = 0$$

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10.	<u>A</u>	<u>B</u>	<u>case</u>
time to fill?	$s$	$s+10$	$15$
how much is filled after 1 minute?	$\frac{1}{s}$	$+$ $\frac{1}{s+10}$	$=$ $\frac{1}{15}$
	↑ amount filled by A in 1 min	↑ amount by B	↑ total completed in 1 min.
	$\frac{1}{s} + \frac{1}{s+10} = \frac{1}{15}$		
	$\frac{15(s+10) + 15s - s(s+10)}{15s(s+10)} = 0$ <span style="color: red;">[<math>\times 15s(s+10)</math>]</span>		
	$15s + 150 + 15s - s^2 - 10s = 0$ <span style="color: red;"><math>s \neq 0, -10</math></span>		
	$-s^2 + 20s + 150 = 0$ <span style="color: red;">[<math>\times (-1)</math>]</span>		
	$s^2 - 20s - 150 = 0$		

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