

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 $\frac{x^2 - x - 6}{x^2 + x - 12} = 0$

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

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

$$\cancel{(x+4)} \frac{x+2}{\cancel{x+4}} = 0 \quad (x+4)$$

$$x+2 = 0$$

$$x = -2$$

numerator only?

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

$$(x-3)(x+2) = 0$$

$$x = 3 \text{ or } x = -2$$

restricted values,

⇒ must factor first!

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

① bring all to one side,
common denominator

② multiply both sides
to eliminate fractions

③ cross-multiply

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

$$(x+2)(x+3) = (x-1)(x-4)$$

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

$$10x + 2 = 0$$

$$10x = -2$$

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

$$x \neq 4$$

$$x \neq -2$$

* check solution
against any
restrictions

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

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

$$\frac{1 \cdot \overbrace{(2)(x-3)}^{x^2-3x}}{x \cdot (2)(x-3)} + \frac{1 \cdot \overbrace{(2)(x)}^{x^2-3x}}{(x-3) \cdot (2)(x)} - \left[\frac{1 \cdot \overbrace{(x)(x-3)}^{x^2-3x}}{2 \cdot (x)(x-3)} \right] = 0$$

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

$$-x^2 + 7x - 6 = 0 \quad \begin{matrix} x \neq 0 \\ x \neq 3 \end{matrix}$$

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

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

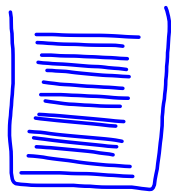
$$x=1, x=6$$

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Assigned Work:

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

10.



how much of the case is filled each unit of time?

$$\frac{A}{\quad} \quad \frac{B}{\quad} \quad \frac{\text{case}}{\quad}$$

$$\frac{1}{s} + \frac{1}{s+10} = \frac{1}{15}$$

↑
filled per
minute

↑
filled
per
minute

↑
total
after 1 minute

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13.

$$\begin{array}{ccc} \overbrace{T \quad P}^{1m \text{ } 20s = \frac{4}{3}m} & & C \\ \frac{1}{s} & \frac{1}{s-2} & \frac{1}{s+1} \\ \underbrace{\hspace{10em}} & & \end{array}$$

$$\frac{1}{s} + \frac{1}{s-2} = \frac{3}{4}$$

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