Solving Rational Equations

Oct 18/2016

Strategies:

(1) Factor numerators and denominators, looking for any common factors to remove.
(note: removed factors are restrictions on solution)

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

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

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

$x + 2 = 0$, $x \neq 3, -4$

$x = -2$

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

$x + 3 = 0$

$x = -3$ $\quad x \neq -3$ no solution

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

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

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

$\frac{(x^2+5x+6)-(x^2-5x+4)}{(x-4)(x+2)}=0$

$\frac{10x+2}{(x-4)(x+2)}=0$

$\frac{2(5x+1)}{(x-4)(x+2)}=0$

$2(5x+1)=0 \quad , \; x\neq 4,-2$

$5x+1=0$

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

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

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

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

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

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

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

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

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

$\boxed{x=6}$ or $\boxed{x=1}$, $x\neq 0,3$

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Assigned Work:

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

13. Tom → s
Paco → $s-2$
Carl → $s+1$

full order
$\frac{1}{s}$

How much of an order can each employee complete in 1 min

T: $\frac{1}{s}$ P: $\frac{1}{s-2}$ C: $\frac{1}{s+1}$

take 1m20s to fill order → in 1 min, how much of this order is filled?

$\frac{1}{1m20s} = \frac{1}{1+\frac{1}{3}}$

$= \frac{1}{\frac{4}{3}}$

$= \frac{3}{4}$

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

$\vdots$

$s = 4$

(b) let t rep. time for all 3 to fill order

$\Rightarrow \frac{1}{t}$ filled in 1 minute

$\frac{1}{s} + \frac{1}{s-2} + \frac{1}{s+1} = \frac{1}{t}$

$\frac{1}{4} + \frac{1}{2} + \frac{1}{5} = \frac{1}{t}$

$\frac{5+10+4}{20} = \frac{1}{t}$

$\frac{19}{20} = \frac{1}{t}$

$t = \frac{20}{19}$

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