Solving Rational Equations

HW:

ex: Solve.

$x \neq 0$

a) $\frac{5}{x} + \frac{1}{3} = \frac{3}{4}$

$\frac{12 \cdot 5}{12 \cdot x} + \frac{1 \cdot 4x}{3 \cdot 4x} - \frac{3 \cdot 3x}{4 \cdot 3x} = 0$

$\frac{60 + 4x - 9x}{12x} = 0$

$\frac{60 - 5x}{12x} = 0$

$\frac{5(12 - x)}{12x} = 0$

$x = 12$

1) State excluded values
2) Get equation = 0
3) Find LCD; combine fractions
4) Simplify. Solve for the zeros of the numerator.
5) Check the excluded values (These are not solutions)

$\frac{2}{0}$ undefined

$\frac{0}{2}$ 0

ex: Solve.

$x \neq -3$

b) $\dfrac{4}{x+3} + \dfrac{5}{6} = \dfrac{23}{18}$

$\dfrac{4 \cdot 18}{18(x+3)} + \dfrac{5 \cdot 3(x+3)}{6 \cdot 3(x+3)} - \dfrac{23(x+3)}{18(x+3)} = 0$

$\dfrac{72 + 15(x+3) - 23(x+3)}{18(x+3)} = 0$

$\dfrac{72 + 15x + 45 - 23x - 69}{18(x+3)} = 0$

$\dfrac{-8x + 48}{18(x+3)} = 0$

$-8x + 48 = 0$

$x = 6$

$(x+3)$ $\cancel{2 \cdot 3}$ $\cancel{3 \cdot 3 \cdot 2}$

$6 \cdot 3(x+3)$

$18(x+3)$

$-8x = -48$

$x = 6$

ex: Solve.

c) $1 - \frac{8}{x-5} = \frac{3}{x}$

$x \neq 5, 0$

$\frac{x(x-5)}{1} - \frac{8(x)}{x-5} - \frac{3(x-5)}{x} = 0$

$x \quad (x-5)$

$\frac{x^2 - 5x - 8x - 3x + 15}{x(x-5)} = 0$

$\frac{x^2 - 16x + 15}{x(x-5)} = 0$

$\frac{(x-15)(x-1)}{x(x-5)} = 0$

$x = 1, 15$

ex: Solve.

$x \neq 1, -1$

d) $\dfrac{2}{x+1} - \dfrac{1}{x-1} = \dfrac{-2}{x^2-1}$

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

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

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

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

$$\frac{1}{x+1} = 0$$

$\cancel{x = 1}$

No solution

ex: Solve.

e) $x - \dfrac{5}{x+1} = 2$