1

Pre-Calc 11 Rational Equations Notes:

Steps to follow:

① Factor each denominator

② Determine non-permissible value(s) on the variable

③ multiply both sides of the equation by the lowest common denominator LCD to eliminate the denominator

④ Solve for the variable may be a quadratic

⑤ Check your answers… Identify extraneous roots.

➔ Substitute solution (root) into original equation to see if it works

➔ Compare your solution to non-permissible value(s) on the variable

$a \neq 0$

e.g.1: $\frac{4}{a} = \frac{1}{2} + \frac{3}{5a}$ LCD: $10a$

$\frac{10a}{1}\left(\frac{4}{a}\right) = \left(\frac{1}{2} + \frac{3}{5a}\right)\frac{10a}{1}$ multiply both sides eqn by LCD

$40 = 5a + 6$ Denominators cancel out

$34 = 5a$ Solve for a

$\frac{34}{5} = a$ check with restriction

e.g.2: $\frac{4x-3}{2x+1} = \frac{2x+1}{x-4}$ $x \neq -\frac{1}{2}, 4$

Cross multiply (top x bottom)

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

$4x^2 - 19x + 12 = 4x^2 + 4x + 1$ solve for x

$-19x + 12 = 4x + 1$

$-23x = -11$

$x = 11/23$

Factor First! $a \neq \pm 2$ LCD $6(a+2)(a-2)$

eg 3: Solve $\frac{2}{a^2-4} + \frac{10}{6a+12} = \frac{1}{a-2}$.

$(a+2)(a-2)\,6(a+2)$

multiply both sides by the LCD

$$6(a+2)(a-2)\left[\frac{2}{(a+2)(a-2)} + \frac{10}{6(a+2)}\right] = \left(\frac{1}{a-2}\right)6(a+2)(a-2)$$

LCD cancels out denominators!

$$12 + 10(a-2) = 6(a+2)$$

$$12 + 10a - 20 = 6a + 12$$

$$4a = 20$$

$$a = 5$$

passes the restrictions above

e.g. 4 Solve $\frac{4k-1}{k+2} - \frac{k+1}{k-2} = \frac{k^2-4k+24}{k^2-4}$

doesn't factor ← $k \neq \pm 2$

$(k+2)(k-2)$ LCD: $(k+2)(k-2)$

multiply the L.C.D. to BOTH sides

$$(k+2)(k-2)\left[\frac{4k-1}{k+2} - \frac{k+1}{k-2}\right] = \left[\frac{k^2-4k+24}{(k+2)(k-2)}\right](k+2)(k-2)$$

$$(4k-1)(k-2) - [(k+1)(k+2)] = k^2 - 4k + 24$$

$$4k^2 - 9k + 2 - k^2 - 3k - 2 = k^2 - 4k + 24$$

$$2k^2 - 8k - 24 = 0 \quad \text{quadratic!}$$

$$k^2 - 4k - 12 = 0 \quad \text{factors!}$$

$$(k-6)(k+2) = 0$$

$k = 6$ or -2 but $k \neq -2$ from above!

extraneous root

$$\boxed{k = 6}$$