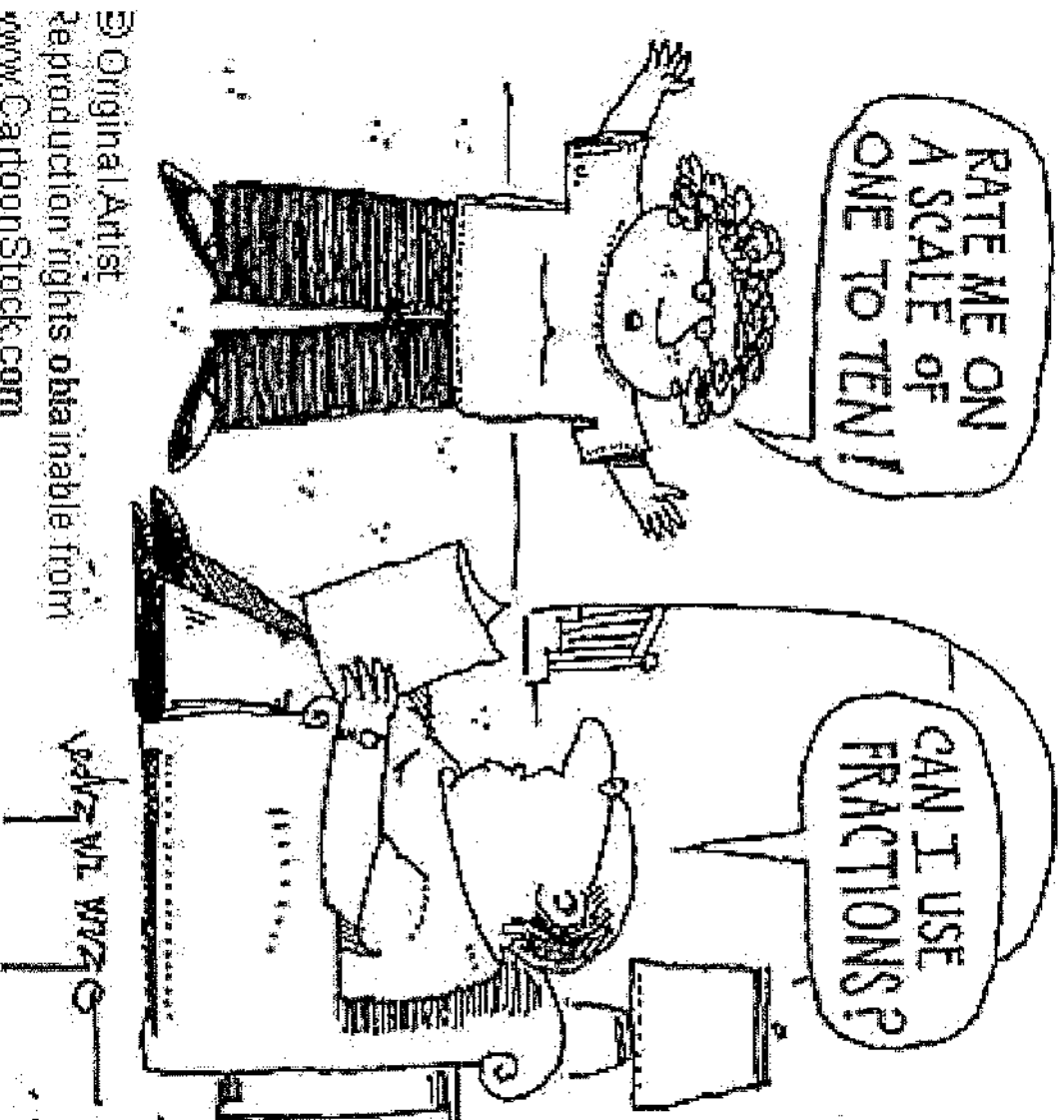


Solving Rational Equations

Notes



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ex: Solve. \longrightarrow "Find X"

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

LCM: $X \cdot 3 \cdot 4$
 $(12X)$

$X \neq 0$

$$\frac{(12)5}{(12)X} + \frac{1(4X)}{3(4X)} = \frac{3(3X)}{4(3X)}$$

$$\frac{60}{12X} + \frac{4X}{12X} = \frac{9X}{12X}$$

$$\frac{4X + 60}{12X} = \frac{9X}{12X}$$

$$\begin{aligned} 4X + 60 &= 9X \\ -4X & \quad -4X \\ \hline 60 &= 5X \end{aligned}$$

$$\frac{60}{5} = \frac{5X}{5}$$

$$X = 12$$

ex: solve.

Find LCM:

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

$$(x+3) \underline{6}$$

$$\begin{array}{c} 18 \\ \swarrow \searrow \\ \underline{6} \quad \underline{3} \end{array}$$

$$\boxed{x \neq -3}$$

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

LCM: $\underline{6} \cdot 3(x+3)$

$$\boxed{18(x+3)}$$

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

$$\frac{15x+117}{18(x+3)} = \frac{23x+69}{18(x+3)}$$

$$\begin{array}{r} 15x + 117 = 23x + 69 \\ -15x \quad -69 \qquad -15x \quad -69 \\ \hline 48 = 8x \end{array}$$

$$\cancel{8x} = \frac{48}{8}$$

$$\boxed{x = 6}$$

ex: solve.

LCM: $x(x-5)$

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

$$\boxed{x \neq 5}$$

$$\boxed{x \neq 0}$$

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

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

$$\frac{x^2 - 13x}{x(x-5)} = \frac{3x - 15}{x(x-5)}$$

Quadratic

$$x^2 - 13x = 3x - 15$$

$$x^2 - 16x + 15 = -15$$

$$x^2 - 16x + 15 = 0$$

$$(x-1)(x-15) = 0$$

$$x-1=0 \quad | \quad x-15=0$$

$$\boxed{x=1} \quad | \quad \boxed{x=15}$$

ex: solve.

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

LCM:
 $(x+1)(x-1)$

DoS

$x \neq -1, 1$

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

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

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

$$x-3 = -2$$

$+3$ $+3$
 $x = 1$ extraneous

NO solution

ex: solve.

LCM: $(x+1)$

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

$$\boxed{x \neq -1}$$

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

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

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

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

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

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

~~Factor~~?
a=1
b=-1
c=-7

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$x = \frac{-(-1) \pm \sqrt{(-1)^2-4(1)(-7)}}{2(1)}$$

$$x = \frac{1 \pm \sqrt{1+28}}{2}$$

$$x = \frac{1 \pm \sqrt{29}}{2}$$

$\sqrt{29}$
1 $\sqrt{29}$