

1) $\frac{x}{5} \neq \frac{x+3}{8}$ or $\left(\frac{8x}{40} = \frac{5x+15}{40}\right)_{40}$

$$8x = 5x + 15$$

$$3x = 15$$

$$\boxed{x = 5}$$

2) $\frac{1}{5x} \neq \frac{1}{9x}$ or $\left(\frac{9}{45x} = \frac{5}{45x}\right)_{45x}$

$$9x = 5x$$

$$4x = 0$$

$$x = 0 \text{ Ext.}$$

$$\frac{1}{5(0)} = \frac{1}{9(0)}$$

undefined

$$9 \neq 5$$

no sol.

$\boxed{\text{no solution}}$

3) $\frac{4}{3x+3} \neq \frac{12}{x^2-1}$ or $\frac{4}{3(x+1)} = \frac{12}{(x+1)(x-1)}$

$$4x^2 - 4 = 36x + 36$$

$$4x^2 - 36x - 40 = 0$$

$$4(x^2 - 9x - 10) = 0$$

$$4(x-10)(x+1) = 0$$

$$\boxed{x = 10} \quad x = -1 \text{ Ext.}$$

$$\frac{4(x-1)}{3(x+1)(x-1)} = \frac{12 \cdot 3}{3(x+1)(x-1)}$$

$$4x - 4 = 36$$

$$4x = 40$$

$$\boxed{x = 10}$$

4) $\frac{2}{x-1} \neq \frac{x+4}{3}$ or $\frac{2}{x-1} = \frac{x+4}{3}$

$$6 = x^2 + 4x - 1x - 4$$

$$0 = x^2 + 3x - 10$$

$$0 = (x+5)(x-2)$$

$$\boxed{x = -5} \quad \boxed{x = 2}$$

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

$$6 = x^2 + 4x - 1x - 4$$

5) $\frac{3}{x+1} \neq \frac{1}{x^2-1}$ or $\frac{3}{x+1} = \frac{1}{(x+1)(x-1)}$

$$3x^2 - 3 = x + 1$$

$$3x^2 - x - 4 = 0$$

$$(3x-4)(x+1) = 0$$

$$\boxed{x = 4/3} \quad x = -1 \text{ Ext.}$$

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

$$3x - 3 = 1$$

$$3x = 4$$

$$\boxed{x = 4/3}$$

6) $\frac{4}{2x-3} \neq \frac{x}{5}$ or $\frac{4}{2x-3} = \frac{x}{5}$

$$20 = 2x^2 - 3x$$

$$0 = 2x^2 - 3x - 20$$

$$0 = (x-4)(2x+5)$$

$$\boxed{x = 4} \quad \boxed{x = -5/2}$$

$$\frac{4 \cdot 5}{(2x-3)5} = \frac{x(2x-3)}{(2x-3)5}$$

$$20 = 2x^2 - 3x$$

7) $\frac{3}{x} \neq \frac{12}{x+7}$ or $\frac{3}{x} = \frac{12}{x+7}$

$$3x + 21 = 12x$$

$$21 = 9x$$

$$\boxed{7/3 = x}$$

$$\frac{3(x+7)}{x(x+7)} = \frac{12x}{x(x+7)}$$

$$3x + 21 = 12x$$

$$21 = 9x$$

$$\boxed{7/3 = x}$$

8) $\frac{10}{6x+7} \neq \frac{6}{2x+9}$ or $\frac{10}{6x+7} = \frac{6}{2x+9}$

$$36x + 42 = 20x + 90$$

$$16x = 48$$

$$\boxed{x = 3}$$

$$\frac{10(2x+9)}{(6x+7)(2x+9)} = \frac{6(6x+7)}{(2x+9)(6x+7)}$$

$$20x + 90 = 36x + 42$$

$$9) \frac{2}{3x-5} \neq \frac{4}{x-15} \quad \text{or} \quad \frac{2}{3x-5} = \frac{4}{x-15}$$

$$2x-30 = 12x-20$$

$$-10 = 10x$$

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

$$\frac{2(x-15)}{(3x-5)(x-15)} = \frac{4(3x-5)}{(x-15)(3x-5)}$$

$$2x-30 = 12x-20$$

$$40) \frac{2}{x+2} - \frac{1}{x} = \frac{-4}{x(x+2)} \quad \text{LCD } x(x+2)$$

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

*dist the neg.

$$2x - x - 2 = -4$$

$$x - 2 = -4$$

$$x = -2$$

$$\text{ext} \rightarrow \boxed{\text{no solution}}$$

$$\frac{2}{-2+2} = \frac{2}{0} \text{ undefined}$$

$$42) c - \frac{c}{3} + \frac{c}{5} = 26 \quad \text{LCD } 15$$

$$\frac{15c}{15} + \frac{-5c}{15} + \frac{3c}{15} = \frac{390}{15}$$

$$15c + 5c + 3c = 390$$

$$13c = 390$$

$$\boxed{c = 30}$$

$$44) \frac{1}{8} + \frac{5x}{x+2} = \frac{5}{2} \quad \text{LCD } 8(x+2)$$

$$\frac{1(x+2)}{8(x+2)} + \frac{5x \cdot 8}{8(x+2)} = \frac{5 \cdot 4(x+2)}{8(x+2)}$$

$$x+2 + 40x = 20x + 40$$

$$2 + 41x = 20x + 40$$

$$21x = 38$$

$$\boxed{x = 38/21 \approx 1.81}$$

$$46) \frac{k}{k+1} + \frac{k}{k-2} = \frac{2}{1} \quad \text{LCD } (k+1)(k-2)$$

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

$$k^2 - 2k + k^2 + k = 2k^2 - 2k - 4$$

$$2k^2 - k = 2k^2 - 2k - 4$$

$$-k = -2k - 4$$

$$\boxed{k = -4}$$

$$48) \frac{5}{x+2} = \frac{-1}{(x+5)(x+2)} + \frac{3}{-1(x+5)} \quad \frac{3}{-1} = -3$$

$$\frac{5}{x+2} = \frac{-1}{(x+5)(x+2)} + \frac{-3}{(x+5)}$$

$$\frac{5(x+5)}{(x+2)(x+5)} = \frac{-1}{(x+5)(x+2)} + \frac{-3(x+2)}{(x+5)(x+2)} \quad \text{LCD } (x+2)(x+5)$$

$$5x + 25 = -1 - 3x - 6$$

$$5x + 25 = -3x - 7$$

$$8x = -32$$

$$\boxed{x = -4}$$

$$59) \frac{5}{2x-1} = \frac{7x}{x^2-25}$$

$$\frac{5}{2x-1} = \frac{7x}{(x+5)(x-5)}$$

$$2x-1 \neq 0 \quad x+5 \neq 0 \quad x-5 \neq 0$$

$$2x \neq 1 \quad x \neq -5 \quad x \neq 5$$

$$x \neq 1/2$$

$$\boxed{B. 0}$$

$$61) A) \frac{x+1}{17} \neq \frac{x+3}{15}$$

$$15x+15 = 17x+51$$

$$-2x = 36$$

$$x = -18$$

$$B) \frac{3}{3x+6} \neq \frac{4}{x^2-4}$$

$$3x^2 - 12 = 12x + 24$$

$$3x^2 - 12x - 36 = 0$$

$$3(x^2 - 4x - 12) = 0$$

$$3(x-6)(x+2) = 0$$

$$x = 6 \quad x = -2$$

$$C) \frac{3x+1}{3x} \neq \frac{5x}{5x+3}$$

$$15x^2 = 15x^2 + 9x + 5x + 3$$

$$0 = 14x + 3$$

$$-3 = 14x$$

$$-3/14 = x$$

$$D) \frac{4}{2x-4} = \frac{1}{x-2}$$

$$\frac{1}{2-2} = \frac{1}{0} = \text{undef.}$$

$$4x - 8 = 2x - 4$$

$$2x = 4$$

$$x = 2 \text{ ext.}$$

$$\boxed{D}$$

Advanced Algebra - Rational Expressions & Equations
Assignment # _____

Name key

Solve.

1. A mason can make a concrete walk in 6 hours. His helper requires 9 hours to do the same job. How long will it take them to make the walk if they work together?

	1 hr alone	together	portion completed
Mason	$\frac{1}{6}$	x	$\frac{1x}{6}$
Helper	$\frac{1}{9}$	x	$\frac{1x}{9}$

$$\frac{1x}{6} + \frac{1x}{9} = 1$$

$$LCD = 18$$

$$\frac{3x}{18} + \frac{2x}{18} = \frac{18}{18}$$

$$3x + 2x = 18$$

$$5x = 18$$

$$x = 3.6 \text{ hrs}$$

2. Working alone, it will take Mandy 8 hours to wallpaper a room. If Pete and Mandy work together, it will take 5 hours. How long will it take Pete if he works alone?

	1 hr alone	together	portion complete
Mandy	$\frac{1}{8}$	5	$\frac{5}{8}$
Pete	$\frac{1}{x}$	5	$\frac{5}{x}$

$$\frac{5}{8} + \frac{5}{x} = 1$$

$$LCD = 8x$$

$$\frac{5x}{8x} + \frac{40}{8x} = \frac{8x}{8x}$$

$$5x + 40 = 8x$$

$$40 = 3x$$

$$13 \frac{1}{3} = x \text{ hrs}$$

3. One pipe can fill a tank in 10 minutes and another can fill it in 20 minutes. If the first pipe is open for 5 minutes before the second is opened, how long will it take them to finish filling the tank?

	1 min	together	portion
Pipe 1	$\frac{1}{10}$	x	$\frac{1x}{10}$
Pipe 2	$\frac{1}{20}$	x	$\frac{1x}{20}$

$$\frac{1x}{10} + \frac{1x}{20} = \frac{1}{2}$$

$$\frac{2x}{20} + \frac{1x}{20} = \frac{10}{20}$$

$$3x = 10$$

$$x = 3 \frac{1}{3} \text{ mins}$$

pipe 1 did half the job before pipe 2 opens

	1 min	together	portion
pipe 1	$\frac{1}{10}$	$x+5$	$\frac{x+5}{10}$
pipe 2	$\frac{1}{20}$	x	$\frac{x}{20}$

$$\frac{x+5}{10} + \frac{x}{20} = 1$$

$$\frac{2x+10}{20} + \frac{x}{20} = \frac{20}{20}$$

$$3x + 10 = 20$$

$$3x = 10$$

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

4. The area of a triangle is $4x^2 - 2x - 6$ square meters. The height of the triangle is $x+1$ meters. Find the length of the base.

$$A = \frac{b \cdot h}{2}$$

$$(4x^2 - 2x - 6) = \frac{b(x+1)}{2}$$

$$\frac{(4x^2 - 2x - 6)(2)}{(x+1)} = \frac{b(x+1)}{(x+1)}$$

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

$$b = 4(2x-3)$$

5. $\frac{4}{y-3} \times \frac{6}{y+3}$
 $4y + 12 = 6y - 18$
 $30 = 2y$
 $15 = y$

6. $\frac{a+1}{1} = \frac{6}{a}$
 $a^2 + a - 6 = 0$
 $(a+3)(a-2) = 0$
 $a = -3 \quad a = 2$
 $a^2 + a = 6$