

4.5

Solving

Rational

Expressions.

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

$$\text{LCD: } 3y(4)(2y)$$

$$\text{NPV: } 3y \neq 0 \quad 2y \neq 0 \\ y \neq 0 \quad y \neq 0$$

$$\cancel{(3y)}(4)(\cancel{2y}) \frac{3-y}{\cancel{3y}} + (\cancel{3y})(\cancel{4})(2y) \frac{1}{\cancel{4}} = (\cancel{3y})(4)(\cancel{2y}) \frac{1}{\cancel{2y}}$$

$$8y(3-y) + 6y^2 = 12y$$

$$24y - 8y^2 + 6y^2 = 12y$$

$$0 = 12y - 24y + 8y^2 - 6y^2$$

$$0 = -12y + 2y^2$$

$$0 = -2y(6-y)$$

$$\begin{array}{l} -2y = 0 \quad \} \quad 6-y = 0 \\ y = 0 \quad \quad \} \quad y = 6 \end{array}$$

So $y=6$ is the real solution
Since $y=0$ is a NPV

$$2.) \frac{5x-3}{x+7} = \frac{5x-14}{x+1}$$

$$\text{LCD: } (x+7)(x+1)$$

$$\text{NPU: } x \neq -7, -1$$

$$(\cancel{x+7})(x+1) \frac{5x-3}{\cancel{x+7}} = (x+7)(\cancel{x+1}) \frac{5x-14}{\cancel{x+1}}$$

$$(x+1)(5x-3) = (x+7)(5x-14)$$

$$5x^2 - 3x + 5x - 3 = 5x^2 - 14x + 35x - 98$$

$$5x^2 + 2x - 3 = 5x^2 + 21x - 98$$

$$0 = 5x^2 - 5x^2 + 21x - 2x - 98 + 3$$

$$0 = 19x - 95$$

$$\frac{95}{19} = \frac{19x}{19}$$

$$\boxed{x = 5} \text{ where } x \neq -1, -7$$

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

$$\text{LCD: } (3x-2)(x+6)$$

$$\text{NPU} \Rightarrow 3x-2 \neq 0 \quad x+6 \neq 0$$

$$\frac{3x \neq 2}{3} \quad \frac{x \neq -6}{3}$$

$$x \neq 2/3$$

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

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

$$6x^2 - 2x + 36x - 12 - [6x^2 + 18x - 4x - 12] = 0$$

$$6x^2 + 34x - 12 - [6x^2 + 14x - 12] = 0$$

$$6x^2 + 34x - 12 - 6x^2 - 14x + 12 = 0$$

$$20x = 0$$

$$x = 0 \text{ Real Answer}$$

$$4.) \frac{1}{x-4} + \frac{2}{x+4} = \frac{5}{x^2-16}$$

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

$$\text{LCD: } (x-4)(x+4)$$

$$\text{NPV } x \neq \pm 4$$

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

$$(x+4)1 + (x-4)2 = 5$$

$$x+4 + 2x-8 = 5$$

$$3x-4 = 5$$

$$3x = 9$$

$$\frac{3x}{3} = \frac{9}{3}$$

$$\boxed{x=3 \text{ Real } x \neq \pm 4}$$

Answer

$$\begin{aligned} \text{Recall} \\ x^2 - 9 &= (x+3)(x-3) \\ 8(x^2 - 1) &= (9x-1)(9x+1) \end{aligned}$$

$$5.) \frac{4x+3}{2x-1} - \frac{2}{1} = \frac{6x+2}{2x-1}$$

$$\text{LCD: } (2x-1) \cdot 1 = 2x-1$$

$$\text{NPDV} \Rightarrow 2x-1 \neq 0$$

$$2x \neq +1$$

$$x \neq +1/2$$

$$(\cancel{2x-1}) \frac{4x+3}{\cancel{2x-1}} - (\cancel{2x-1}) \frac{2}{1} = (\cancel{2x-1}) \frac{6x+2}{\cancel{2x-1}}$$

$$4x+3 - (4x-2) = 6x+2$$

$$4x+3 - 4x + 2 = 6x+2$$

$$5 = 6x + 2$$

$$5 - 2 = 6x$$

$$3 = 6x$$

$$x = 3/6 = 1/2$$

Extraneous Root
 $x \neq 1/2$ (NPDV)

$$6.) \frac{6}{p} = \frac{1}{p-5} - \frac{p+4}{p^2-5p}$$

$$\frac{6}{p} = \frac{1}{p-5} - \frac{p+4}{p(p-5)}$$

LCD: $p(p-5)$

NPV $p \neq 0, +5$

$$\cancel{p(p-5)} \frac{6}{\cancel{p}} = p \cancel{(p-5)} \frac{1}{\cancel{p-5}} - \cancel{p(p-5)} \frac{p+4}{\cancel{p(p-5)}}$$

$$(p-5)6 = p - (p+4)$$

$$6p - 30 = p - p - 4$$

$$6p - 30 = -4$$

$$6p = 30 - 4$$

$$6p = 26$$

$$p = \frac{26}{6} = \frac{13}{3}$$

where $p \neq 0, +5$

$$7.) \frac{3n+15}{4n^2} = \frac{1}{n^2} - \frac{n-3}{4n^2}$$

$$\text{LCD: } 4n^2$$

$$\text{NPV} \Rightarrow 4n^2 \neq 0 \\ n \neq 0$$

$$\cancel{4n^2} \left(\frac{3n+15}{\cancel{4n^2}} \right) = \cancel{4n^2} \left(\frac{1}{n^2} \right) - \cancel{4n^2} \left(\frac{n-3}{\cancel{4n^2}} \right)$$

$$3n+15 = 4 - (n-3)$$

$$3n+15 = 4 - n + 3$$

$$3n+15 = 7 - n$$

$$4n = 7 - 15$$

$$4n = -8$$

$$n = \frac{-8}{4} = -2$$

$$\text{when } n \neq 0$$

End of Material
for Midterm