

## Section 3.5 – Practice Problems

Solve the equation

1.  $\frac{x}{2} + \frac{x}{3} = 5$  LCD: 6

$$6\left(\frac{x}{2}\right) + 6\left(\frac{x}{3}\right) = 6 \cdot 5$$

$$3x + 2x = 30$$

$$5x = 30$$

$$\boxed{x = 6}$$

2.  $\frac{y}{3} + 5 = \frac{3y}{4}$  LCD: 12

$$4y + 60 = 9y$$

$$60 = 5y$$

$$\boxed{12 = y}$$

3.  $\frac{x}{4} - x - \frac{3}{2} = 0$  LCD: 4

$$x - 4x - 6 = 0$$

$$-3x = 6$$

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

4.  $\frac{y}{2} + \frac{5y}{4} = \frac{y}{12}$  LCD: 12

$$6y + 15y = y$$

$$21y = y$$

$$20y = 0$$

$$\boxed{y = 0}$$

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

$$\frac{3x+3}{4} = x+1$$

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

$$3x+3 = 4x+4$$

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

6.  $\frac{2(y-1)}{3} + 5 = y$

$$\left(\frac{2y-2}{3} + 5 = y\right) \cdot 3$$

$$2y-2+15 = 3y$$

$$\boxed{13 = y}$$

7.  $\frac{6}{3} \cdot \frac{x-4}{3} - \frac{6}{2} \cdot \frac{x-2}{2} = -\frac{5}{6} \cdot 6$  LCD: 6

$$2(x-4) - 3(x-2) = -5$$

$$2x-8-3x+6 = -5$$

$$-x-2 = -5$$

$$-x = -3$$

$$\boxed{x = 3}$$

8.  $\frac{35}{5} \cdot \frac{3x}{5} - \frac{(x-5)^{35}}{7} = 3 \cdot 35$  LCD: 35

$$21x - 5(x-5) = 105$$

$$21x - 5x + 25 = 105$$

$$16x = 80$$

$$\boxed{x = 5}$$

$$9. \frac{12}{4} \frac{x+2}{2} - \frac{12}{2} \frac{x-1}{3} = \frac{2}{3} \cdot 12 \quad \text{LCD} = 12$$

$$3(x+2) - 6(x-1) = 2 \cdot 4$$

$$3x + 6 - 6x + 6 = 8$$

$$-3x + 12 = 8$$

$$-3x = -4$$

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

Solve. Check your solutions.

$$11. \frac{9x}{3x} \frac{5}{9} - \frac{9x}{9} \frac{1}{x} = \frac{4}{x} \cdot 9x \quad \text{LCD} = 9x$$

$$15 - x = 36 \rightarrow \boxed{x = -21}$$

Check:

$$\frac{5}{3(-21)} - \frac{1}{9} = \frac{4}{-21}$$

$$\frac{-5}{63} - \frac{1}{9} = \frac{-4}{21}$$

$$\frac{-5}{63} - \frac{7}{63} = \frac{-4}{21}$$

$$\frac{-12}{63} = \frac{-4}{21} \rightarrow \frac{-4}{21} = \frac{-4}{21} \checkmark$$

$$10. \frac{15}{5} \frac{4x+1}{3} = \frac{15}{3} \frac{8x+2}{3} + 1 \cdot 15 \quad \text{LCD} = 15$$

$$3(4x+1) = 5(8x+2) + 15$$

$$12x + 3 = 40x + 10 + 15$$

$$12x = 40x + 22$$

$$-28x = 22$$

$$x = -\frac{22}{28}$$

$$\boxed{x = -\frac{11}{14}}$$

$$12. \frac{7}{x+3} = \frac{5}{x-9} \rightarrow 7(x-9) = 5(x+3)$$

$$7x - 63 = 5x + 15$$

$$2x = 78$$

$$\boxed{x = 39}$$

check:

$$\frac{7}{42} = \frac{5}{30}$$

↓

$$210 = 210 \checkmark$$

$$13. \frac{y}{y+3} - 2 = \frac{-3}{y+3}$$

$$y - 2(y+3) = -3$$

$$y - 2y - 6 = -3$$

$$-y = 3 \rightarrow y = -3$$

Check:

$$\frac{-3}{0} \leftarrow \text{not allowed}$$

NO SOLUTION

$$14. \frac{1}{2x} + \frac{4}{x} = \frac{9}{2x}$$

$$\frac{1+8}{2x} = \frac{9}{2x}$$

$$9 = 9$$

$x = \text{anything except } 0$

$x \neq 0$

$$15. \frac{2}{z+5} + \frac{20}{z^2-25} = \frac{-3}{5-z}$$

$$\frac{2}{x+5} + \frac{20}{(x+5)(x-5)} = \frac{-3}{(-1)(z-5)}$$

$$2(x-5) + 20 = 3(x+5)$$

$$2x - 10 + 20 = 3x + 15$$

$$2x + 10 = 3x + 15$$

$$-5 = x$$

check:

$$\frac{2}{0} \leftarrow \text{NOPE}$$

NO SOLUTION

$$16. \frac{3}{x-1} + \frac{1}{2x-2} = \frac{7}{4}$$

$$\frac{3}{x-1} + \frac{1}{2(x-1)} = \frac{7}{4}$$

$$\frac{4 \cdot 3}{4(x-1)} + \frac{2}{4(x-1)} = \frac{7(x-1)}{4(x-1)}$$

$$12 + 2 = 7x - 7$$

$$21 = 7x$$

$x = 3$

check:

$$\frac{3}{2} + \frac{1}{4} = \frac{7}{4} \rightarrow \frac{6}{4} + \frac{1}{4} = \frac{7}{4} \quad \checkmark$$

$$17. \frac{2y}{y^2-1} = \frac{2}{y+1} + \frac{1}{1-y}$$

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

$$2y = 2(y-1) - 1(y+1)$$

$$2y = 2y - 2 - y - 1 \rightarrow \boxed{y = -3}$$

check:

$$\frac{-6}{8} = \frac{2}{-2} + \frac{1}{4}$$

$$\frac{-6}{8} = -1 + \frac{1}{4} \rightarrow \frac{-6}{8} = \frac{-8}{8} + \frac{2}{8}$$

$$\frac{-6}{8} = \frac{-6}{8} \checkmark$$

$$19. \frac{2}{x} - \frac{x}{5x-12} = 0$$

$$2(5x-12) - x^2 = 0$$

$$10x - 24 - x^2 = 0$$

$$x^2 - 10x + 24 = 0 \rightarrow (x-6)(x-4) = 0$$

$$\boxed{x=6 \quad x=4}$$

check:

$$\frac{2}{6} - \frac{6}{18} = 0$$

$$\frac{2}{4} - \frac{4}{8} = 0$$

$$\frac{1}{3} - \frac{1}{3} = 0 \checkmark$$

$$\frac{1}{2} - \frac{1}{2} = 0 \checkmark$$

$$18. \frac{z}{2z+2} + \frac{2z}{4z+4} = \frac{2z-3}{z+1}$$

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

$$2z + 2z = 4(2z-3)$$

$$4z = 8z - 12$$

$$-4z = -12$$

$$\boxed{z=3}$$

check:

$$\frac{3}{8} + \frac{6}{16} = \frac{3}{4}$$

$$\frac{6}{16} + \frac{6}{16} = \frac{3}{4}$$

$$\frac{12}{16} = \frac{3}{4} \rightarrow \frac{3}{4} = \frac{3}{4} \checkmark$$

$$20. \frac{y^2+3}{y-1} = \frac{4}{y-1}$$

Denominators cancel out

$$y^2+3 = 4$$

$$y^2 = 1 \quad y = \pm 1$$

check:  $y=1$  is not allowed

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

$$\frac{4}{-2} = \frac{4}{-2} \checkmark$$

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

D:  $y \neq -1$

21.  $\frac{y}{2y+2} + \frac{2y-16}{4y+4} = \frac{2y-3}{y+1}$

$\frac{y}{2(y+1)} + \frac{2(y-8)}{4(y+1)} = \frac{2y-3}{y+1}$

$\frac{y}{2(y+1)} + \frac{y-8}{2(y+1)} = \frac{2(2y-3)}{2(y+1)}$

$y + y - 8 = 4y - 6$

$-2y = 2 \quad y = -1$

NO SOLUTION

check:

~~$\frac{1}{4} + \frac{-16}{8} = \frac{-1}{2}$~~

~~$\frac{2}{8} - \frac{16}{8} = \frac{-1}{2}$~~

~~$\frac{-16}{8} = \frac{-1}{2}$~~

NOT TRUE

NO SOLUTION

~~$-2 \neq -\frac{1}{2}$~~

22.  $\frac{5}{4z-2} - \frac{1}{1-2z} = \frac{7}{3z+6}$

$\frac{5}{2(2z-1)} - \frac{1}{(-1)(2z-1)} = \frac{7}{3(z+2)}$

$\frac{5}{2(2z-1)} + \frac{1}{(2z-1)} = \frac{7}{3(z+2)}$

$5(3)(z+2) + 6(z+2) = 7(2)(2z-1)$

$15z + 30 + 6z + 12 = 28z - 14$

$21z + 42 = 28z - 14$

$56 = 7z$

$z = 8$

check:

$\frac{5}{30} - \frac{-1}{15} = \frac{7}{30} \rightarrow \frac{5}{30} + \frac{2}{30} = \frac{7}{30} \checkmark$

23.  $\frac{2x+3}{x-1} - \frac{2}{x+3} = \frac{5-6x}{x^2+2x-3}$

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

$(2x+3)(x+3) - [2(x-1)] = 5-6x$

$2x^2 + 9x + 9 - 2x + 2 = 5 - 6x$

$2x^2 + 13x + 6 = 0$

$(2x+1)(x+6) = 0$

$x = -6$

$x = -\frac{1}{2}$

check

$\frac{-9}{-7} - \frac{2}{-3} = \frac{41}{21}$

$\frac{41}{21} = \frac{41}{21} \checkmark$

$\frac{2}{-\frac{3}{2}} - \frac{2}{\frac{5}{2}} = \frac{8}{-\frac{15}{4}}$

$\frac{-20}{15} - \frac{12}{15} = \frac{-32}{15}$

24.  $\frac{x+1}{x+3} + \frac{x-3}{x-2} = \frac{x^2-11x}{x^2+x-6}$

$\frac{x+1}{x+3} + \frac{x-3}{x-2} = \frac{x(x-11)}{(x+3)(x-2)}$

$(x+1)(x-2) + (x-3)(x+3) = x^2 - 11x$

$x^2 - x - 2 + x^2 - 9 = x^2 - 11x$

$2x^2 - x - 11 = x^2 - 11x$

$x^2 + 10x - 11 = 0$

$(x+11)(x-1) = 0$

$x = -11$

$x = 1$

check:

$\frac{-10}{-8} + \frac{-14}{-13} = \frac{242}{104}$

$\frac{5}{4} + \frac{14}{13} = \frac{121}{52}$

$\frac{121}{52} = \frac{121}{52} \checkmark$

$\frac{2}{4} + \frac{-2}{-1} = \frac{-10}{-4}$

$\frac{1}{2} + 2 = \frac{5}{2} \checkmark$

$D: x \neq \pm 1$

25.  $\frac{3-2x}{x+1} - \frac{10}{x^2-1} = \frac{2x+3}{1-x}$

$(x-1) \frac{3-2x}{x+1} - \frac{10}{(x+1)(x-1)} = \frac{2x+3}{(-1)(x+1)(x-1)}$

$(3-2x)(x-1) - 10 = (-1)(2x+3)(x+1)$

$3x - 3 - 2x^2 + 2x - 10 = -1(2x^2 + 2x + 3x + 3)$

$-2x^2 + 5x - 13 = -2x^2 - 5x - 3$

$10x - 13 = -3$

NO SOLUTION

$10x = 10$

$x = 1$

Domain Restriction

so

26.  $\frac{3y-7}{y^2-5y+6} + \frac{2y+8}{9-y^2} - \frac{y+2}{y^2+y-6} = 0$

$\frac{3y-7}{(y-2)(y-3)} + \frac{2(y+4)}{(-1)(y+3)(y-3)} - \frac{y+2}{(y+3)(y-2)} = 0$

$\frac{3y-7}{(y-2)(y+3)} - \frac{[2(y+4)]}{(y+3)(y-3)} - \frac{(y+2)}{(y+3)(y-2)} = 0$

$(3y-7)(y+3) - (2y+8)(y-2) - (y+2)(y-3) = 0$

$3y^2 + 2y - 21 - [2y^2 + 4y - 16] - [y^2 - y - 6] = 0$

$3y^2 + 2y - 21 - 2y^2 - 4y + 16 - y^2 + y + 6 = 0$

$-y + 1 = 0$

$-y = -1$

$y = 1$

check:

$\frac{-4}{2} + \frac{10}{8} - \frac{3}{-4} = 0$

$-2 + \frac{5}{4} + \frac{3}{4} = 0$

$-2 + \frac{8}{4} = 0$

$0 = 0 \checkmark$