

7.7

$$1) \quad (2x)3x - (2x)\frac{1}{2} - (2x)\frac{1}{x} = 0(2x)$$

LCD:  $2x$

$$\frac{2x}{2} \neq \frac{0}{2}$$

$* x \neq 0 *$

$$6x^2 - x - 2 = 0$$

$$(2x+1)(3x-2) = 0$$

$$2x+1=0 \quad 3x-2=0$$

$$\begin{array}{r} -1 \quad -1 \\ \hline \frac{2x}{2} = \frac{-1}{2} \end{array} \quad \begin{array}{r} +2 \quad +2 \\ \hline \frac{3x}{3} = \frac{2}{3} \\ x = -\frac{1}{2} \quad x = \frac{2}{3} \end{array}$$

$$3) \quad x(x-4) + \frac{20}{(x-4)}(x-4) = \frac{5x}{(x-4)}(x-4) - 2(x-4)$$

LCD:  $(x-4)$

$$x-4 \neq 0$$

$$\begin{array}{r} +4 \quad +4 \\ \hline *x \neq 4 * \end{array}$$

$$x^2 - 4x + 20 = 5x - 2x + 8$$

$$x^2 - 4x + 20 = 3x + 8$$

$$\begin{array}{r} -3x - 8 \quad -3x - 8 \\ \hline \end{array}$$

$$x^2 - 7x + 12 = 0$$

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

$$x-4=0 \quad x-3=0$$

$$\begin{array}{r} +4 \quad +4 \\ \hline \cancel{x-4} \quad \begin{array}{r} +3 \quad +3 \\ \hline x=3 \end{array} \end{array}$$

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

LCD =  $x-3$

$$x-3 \neq 0$$

$$\begin{array}{r} +3 \quad +3 \\ \hline *x \neq 3 * \end{array}$$

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

$$\begin{array}{r} -2x \quad -2x \\ \hline \end{array}$$

$$x^2 - 5x + 6 = 0$$

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

$$x-2=0 \quad x-3=0$$

$$\begin{array}{r} +2 \quad +2 \\ \hline x=2 \quad \begin{array}{r} +3 \quad +3 \\ \hline \cancel{x-3} \end{array} \end{array}$$

$$7) \frac{2x}{3x-4} (6x-1)(3x-4) = \frac{4x+5}{6x-1} (6x-1)(3x-4) - \frac{3}{3x-4} (6x-1)(3x-4)$$

*LCD : (6x-1)(3x-4)*

$$6x-1 \neq 0 \quad 3x-4 \neq 0$$

$$\begin{array}{r} +1 \quad +1 \\ \hline \frac{6x}{6} \neq \frac{1}{6} \end{array} \quad \begin{array}{r} +4 \quad +4 \\ \hline \frac{3x}{3} \neq \frac{4}{3} \end{array}$$

$$* x \neq \frac{1}{6} * * x \neq \frac{4}{3} *$$

$$12x^2 - 2x = 12x^2 - 16x + 15x - 20 - 18x + 3$$

$$12x^2 - 2x = 12x^2 - 19x - 17$$

$$\begin{array}{r} -12x^2 \quad -12x^2 \\ \hline -2x = -19x - 17 \end{array}$$

$$\begin{array}{r} +19x \quad +19x \\ \hline \frac{17x}{17} = -\frac{17}{17} \end{array}$$

$$x = -1$$

$$9) \frac{\frac{3m}{2m-5}}{(2)(2m-5)(3m+1)} - \frac{\frac{7}{3m+1}}{(2)(2m-5)(3m+1)} = \frac{\frac{3}{2}}{(2)(2m-5)(3m+1)}$$

*LCD: (2)(2m-5)(3m+1)*

$$2m-5 \neq 0 \quad 3m+1 \neq 0$$

$$\begin{array}{r} +5 \quad +5 \\ \hline \frac{2m}{2} \neq \frac{5}{2} \end{array} \quad \begin{array}{r} -1 \quad -1 \\ \hline \frac{3m}{3} \neq -\frac{1}{3} \end{array}$$

$$* x \neq \frac{5}{2} * * x \neq -\frac{1}{3} *$$

$$18m^2 + 6m - 28m + 70 = 18m^2 - 39m - 15$$

$$18m^2 - 22m + 70 = 18m^2 - 39m - 15$$

$$\begin{array}{r} -18m^2 \quad -18m^2 \\ \hline -22m + 70 = -39m - 15 \end{array}$$

$$\begin{array}{r} +39m \quad +39m \\ \hline 17m + 70 = -15 \end{array}$$

$$\begin{array}{r} -70 \quad -70 \\ \hline \frac{17m}{17} = \frac{-85}{17} \end{array}$$

$$m = -5$$

$$11) \frac{\frac{4-x}{1-x}}{(1-x)(3-x)} = \frac{\frac{12}{3-x}}{(1-x)(3-x)}$$

*LCD : (1-x)(3-x)*

$$1-x \neq 0 \quad 3-x \neq 0$$

$$\begin{array}{r} +x \quad +x \quad +x \quad +x \\ \hline * 1 \neq x * * 3 \neq x * \end{array}$$

$$12 - 4x - 3x + x^2 = 12 - 12x$$

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

$$\begin{array}{r} +12x - 12 \quad -12 + 12x \\ \hline x^2 + 5x = 0 \end{array}$$

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

$$x = 0 \quad x + 5 = 0$$

$$\begin{array}{r} -5 \\ -5 \\ \hline x = -5 \end{array}$$

$$13) \frac{7}{y-3} (2)(y-3)(y-4) - \frac{1}{2} (2)(y-3)(y-4) = \frac{y-2}{y-4} (2)(y-3)(y-4)$$

LCD :  $(2)(y-3)(y-4)$

$$y-3 \neq 0 \quad y-4 \neq 0$$

$$\begin{array}{r} +3 \\ +3 \\ \hline +4 \end{array} \quad \begin{array}{r} +4 \\ +4 \\ \hline +4 \end{array}$$

$$*y \neq 3 * * y \neq 4 *$$

$$14y - 56 - y^2 + 3y + 4y - 12 = 2y^2 - 6y - 4y + 12$$

$$-y^2 + 21y - 68 = 2y^2 - 10y + 12$$

$$\begin{array}{r} +y^2 \\ -21y \\ \hline +y^2 \end{array} \quad \begin{array}{r} +68 \\ +68 \\ \hline +68 \end{array}$$

$$0 = 3y^2 - 31y + 80$$

$$0 = (3y - 16)(y - 5)$$

$$3y - 16 = 0 \quad y - 5 = 0$$

$$\begin{array}{r} +16 \\ +16 \\ \hline +5 \end{array} \quad \begin{array}{r} +5 \\ +5 \\ \hline +5 \end{array}$$

$$\begin{array}{r} \frac{3y}{3} = \frac{16}{3} \\ y = 5 \end{array}$$

$$15) \frac{1}{x+2} (x+2)(x-2) + \frac{1}{x-2} (x+2)(x-2) = \frac{3x+8}{x^2-4} (x+2)(x-2)$$

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

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

$$\begin{array}{r} -2 \\ -2 \\ \hline x \neq -2 \end{array} \quad \begin{array}{r} +2 \\ +2 \\ \hline x \neq 2 \end{array}$$

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

$$2x = 3x+8$$

$$\begin{array}{r} -3x \\ -3x \\ \hline -x \end{array}$$

$$\begin{array}{r} -1 \\ -1 \\ \hline -1 \end{array}$$

$$x = -8$$

$$17) \frac{(x+1)}{x-1} (6)(x-1)(x+1) + \frac{-x+1}{x+1} (6)(x-1)(x+1) = \frac{5}{6} (6)(x-1)(x+1)$$

LCD:  $(6)(x-1)(x+1)$

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

$$\begin{array}{r} +1 \\ +1 \\ \hline -1 \end{array} \quad \begin{array}{r} -1 \\ -1 \\ \hline -1 \end{array}$$

$$*x \neq 1 * * x \neq -1 *$$

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

$$24x = 5x^2 - 5$$

$$\begin{array}{r} -24x \\ -24x \\ \hline -24x \end{array}$$

$$0 = 5x^2 - 24x - 5$$

$$0 = (5x+1)(x-5)$$

$$\begin{array}{rcl}
 5x + 1 = 0 & x - 5 = 0 \\
 \hline
 -1 - 1 & +5 + 5 \\
 \hline
 \frac{5x}{5} = \frac{-1}{5} & x = 5 \\
 x = -\frac{1}{5}
 \end{array}$$

$$19) \frac{\frac{3}{2x+1}}{(2x+1)(2x-1)} + \frac{\frac{-2x-1}{2x-1}}{(2x+1)(2x-1)} = 1 \frac{\frac{(2x+1)(2x-1)}{1}}{(2x+1)(2x-1)} - \frac{\frac{8x^2}{4x^2-1}}{(2x+1)(2x-1)}$$

LCD :  $(2x+1)(2x-1)$

$$\begin{array}{rcl}
 2x + 1 \neq 0 & 2x - 1 \neq 0 \\
 \hline
 -1 - 1 & +1 + 1 \\
 \hline
 \frac{2x}{2} \neq \frac{-1}{2} & \frac{2x}{2} \neq \frac{1}{2} \\
 *x \neq -\frac{1}{2} & *x \neq \frac{1}{2} *
 \end{array}$$

$$\begin{array}{rcl}
 6x - 3 - 4x^2 - 2x - 2x - 1 = 4x^2 - 1 - 8x^2 \\
 -4x^2 + 2x - 4 = -4x^2 - 1 \\
 \hline
 +4x^2 & +4x^2 \\
 \hline
 2x - 4 = -1 \\
 \hline
 +4 + 4 \\
 \hline
 \frac{2x}{2} = \frac{3}{2} \\
 x = \frac{3}{2}
 \end{array}$$

$$21) \frac{\frac{x-2}{x+3}}{(x+3)(x-2)} - \frac{\frac{1}{x-2}}{(x+3)(x-2)} = \frac{\frac{1}{x^2+x-6}}{(x-2)(x+3)} (x+3)(x-2)$$

LCD :  $(x+3)(x-2)$

$$\begin{array}{rcl}
 x + 3 \neq 0 & x - 2 \neq 0 \\
 \hline
 -3 - 3 & +2 + 2 \\
 \hline
 *x \neq -3 & **x \neq 2 *
 \end{array}$$

$$\begin{array}{rcl}
 x^2 - 4x + 4 - x - 3 = 1 \\
 x^2 - 5x + 1 = 1 \\
 \hline
 -1 - 1 \\
 \hline
 x^2 - 5x = 0 \\
 x(x-5) = 0 \\
 x = 0 \quad x - 5 = 0 \\
 \hline
 +5 + 5 \\
 \hline
 x = 5
 \end{array}$$

$5(x+4)$

$$23) \frac{3}{x+2} + \frac{x-1}{x+5} = \frac{5x+20}{6x+24}$$

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

*LCD : (6)(x+2)(x+5)*

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

$$\frac{-2}{x+2} \quad \frac{-2}{x+5}$$

\*  $x \neq -2$  \*  $x \neq -5$  \*

$$18x + 90 + 6x^2 + 12x - 6x - 12 = 5x^2 + 25x + 10x + 50$$

$$6x^2 + 24x + 78 = 5x^2 + 35x + 50$$

$$\frac{-5x^2 - 35x - 50}{x^2 - 11x + 28} = -5x^2 - 35x - 50$$

$$x^2 - 11x + 28 = 0$$

$$(x-7)(x-4) = 0$$

$$x-7=0 \quad x-4=0$$

$$\frac{+7}{x=7} \quad \frac{+7}{x=4}$$

$$25) \frac{x}{x-1} (x+1)(x-1) - \frac{2}{x+1} (x+1)(x-1) = \frac{4x^2}{x^2-1} (x+1)(x-1)$$

$(x+1)(x-1)$

*LCD : (x+1)(x-1)*

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

$$\frac{-1}{x+1} \quad \frac{-1}{x-1} \quad \frac{+1}{x+1} \quad \frac{+1}{x-1}$$

\*  $x \neq -1$  \*  $x \neq 1$  \*

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

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

$$\frac{-x^2 + x - 2}{0} = -x^2 + x - 2$$

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

$$0 = (3x-2)(x+1)$$

$$3x-2=0 \quad x+1=0$$

$$\frac{+2}{3} \quad \frac{+2}{3}$$

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

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

$$x = -1$$

$$27) \frac{2x}{x+1}(x+1)(x+5) - \frac{3}{x+5}(x+1)(x+5) = \frac{-8x^2}{x^2+6x+5}(x+1)(x+5)$$

*LCD : (x + 1)(x + 5)*

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

$$\begin{array}{r} -1 \quad -1 \\ \hline *x \neq -1 \end{array} \quad \begin{array}{r} -5 \quad -5 \\ \hline **x \neq -5 \end{array}$$

$$2x^2 + 10x - 3x - 3 = -8x^2$$

$$2x^2 + 7x - 3 = -8x^2$$

$$\begin{array}{r} +8x^2 \\ \hline +8x^2 \end{array}$$

$$10x^2 + 7x - 3 = 0$$

$$(10x - 3)(x + 1) = 0$$

$$10x - 3 = 0 \quad x + 1 = 0$$

$$\begin{array}{r} +3 \quad +3 \\ \hline \frac{10x}{10} = \frac{3}{10} \end{array}$$

$$x = -\frac{3}{10}$$

$$29) \frac{x-5}{x-9}(x-9)(x-3) + \frac{x+3}{x-3}(x-9)(x-3) = \frac{-4x^2}{x^2-12x+27}(x-9)(x-3)$$

*LCD : (x - 9)(x - 3)*

$$x - 9 \neq 0 \quad x - 3 \neq 0$$

$$\begin{array}{r} +9 \quad +9 \\ \hline *x \neq 9 \end{array} \quad \begin{array}{r} +3 \quad +3 \\ \hline **x \neq 3 \end{array}$$

$$x^2 - 3x - 5x + 15 + x^2 - 9x + 3x - 27 = -4x^2$$

$$2x^2 - 14x - 12 = -4x^2$$

$$\begin{array}{r} +4x^2 \\ \hline +4x^2 \end{array}$$

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

$$2(3x^2 - 7x - 6) = 0$$

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

$$3x + 2 = 0 \quad x - 3 = 0$$

$$\begin{array}{r} -2 \quad -2 \\ \hline \frac{3x}{3} = \frac{-2}{3} \end{array}$$

$$x = -\frac{2}{3}$$

$$31) \frac{x-3}{x-6} (x-6)(x+3) + \frac{x+5}{x+3} (x-6)(x+3) = \frac{-2x^2}{x^2-3x-18} (x-6)(x+3)$$

$$LCD : (x-6)(x+3)$$

$$x-6 \neq 0 \quad x+3 \neq 0$$

$$\begin{array}{r} +6 \quad +6 \quad -3 \quad -3 \\ *x \neq 6 \quad *x \neq -3 \end{array}$$

$$x^2 - 9 + x^2 - 6x + 5x - 30 = -2x^2$$

$$2x^2 - x - 90 = -2x^2$$

$$\begin{array}{r} +2x^2 \\ 4x^2 - x - 90 = 0 \end{array}$$

$$(4x-13)(x+3) = 0$$

$$4x-13=0 \quad x+3=0$$

$$\begin{array}{r} +13 \quad +13 \quad -3 \quad -3 \\ *x = \frac{13}{4} \end{array}$$

$$x = -3$$

$$x = \frac{13}{4}$$

$$33) \frac{4x+1}{x+3} (x+3)(x-1) + \frac{5x-3}{x-1} (x+3)(x-1) = \frac{8x^2}{x^2+2x-3} (x+3)(x-1)$$

$$LCD : (x+3)(x-1)$$

$$x+3 \neq 0 \quad x-1 \neq 0$$

$$\begin{array}{r} -3 \quad -3 \quad +1 \quad +1 \\ *x \neq -3 \quad *x \neq 1 \end{array}$$

$$4x^2 - 4x + x - 1 + 5x^2 + 15x - 3x - 9 = 8x^2$$

$$9x^2 + 9x - 10 = 8x^2$$

$$\begin{array}{r} -8x^2 \\ x^2 + 9x - 10 = 0 \end{array}$$

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

$$x+10=0 \quad x-1=0$$

$$\begin{array}{r} -10 \quad -10 \quad +1 \quad +1 \\ x = -10 \quad \cancel{x-1} \end{array}$$