

Answer the following in simplest form:

$$1) \frac{x+1}{3x-15} \cdot \frac{8x-80}{x^2-9x-10}$$

$$= \frac{\cancel{x+1}}{3(x-5)} \cdot \frac{8\cancel{x-10}}{(x-10)(x+1)}$$

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

$$2) \frac{45x^2}{x-9} \cdot \frac{x^2-5x-36}{3x^3+12x^2}$$

$$\frac{45 \cdot x^2}{\cancel{x-9}} \cdot \frac{(x-9)(x+4)}{3x^2(x+4)}$$

$$= \frac{15 \cdot \cancel{45} \cdot \cancel{x^2}}{\cancel{3} \cdot \cancel{x^2}} = 15$$

$$3) \frac{x^2-10x+25}{10x-100} \cdot \frac{x-10}{45-9x}$$

$$\frac{(x-5)(\cancel{x-5})}{10(x-10)} \cdot \frac{(x-10)}{-9(\cancel{x-5})}$$

$$= \frac{(x-5)}{10 \cdot (-9)} = \frac{(x-5)}{-90}$$

$$4) \frac{3x^2-25x-18}{27x+18} \div \frac{5x-3}{5x^2-33x+18}$$

$$= \frac{3x^2-25x-18}{27x+18} \cdot \frac{5x^2-33x+18}{5x-3}$$

$$= \frac{(3x+2)(x-9)}{9(3x+2)} \cdot \frac{(5x+3)(x-6)}{(5x+3)}$$

$$= \frac{(x-9)(x-6)}{9}$$

$$5) \frac{x^2+11x+24}{x^2-15x+56} \div \frac{x^2-x-12}{x^2-11x+28}$$

$$\frac{x^2+11x+24}{x^2-15x+56} \cdot \frac{x^2-11x+28}{x^2-x-12}$$

$$\frac{(x+8)(\cancel{x+3})}{(x-8)(\cancel{x-7})} \cdot \frac{(\cancel{x-7})(x-4)}{(\cancel{x-4})(x+3)}$$

$$= \frac{(x+8)}{(x-8)}$$

$$6) \frac{x^2+10x+24}{x^2-5x+6} \div \frac{x^2+11x+28}{x^2-6x+9} \cdot \frac{x^2+x-42}{x^2+3x-18}$$

$$\frac{x^2+10x+24}{x^2-5x+6} \cdot \frac{x^2-6x+9}{x^2+11x+28} \cdot \frac{x^2+x-42}{x^2+3x-18}$$

$$\frac{(x+6)(\cancel{x+4})}{(x-2)(\cancel{x-3})} \cdot \frac{(\cancel{x-3})(\cancel{x-3})}{(\cancel{x+7})(x+4)} \cdot \frac{(\cancel{x+7})(x-6)}{(\cancel{x+6})(\cancel{x-3})} = \frac{(x-6)}{(x-2)} \quad \text{or} \quad \frac{x-6}{x-2}$$

$$7) \frac{6}{x^2-4} + \frac{2}{x^2-5x+6}$$

$$(x-2)(x+2) \quad \hookrightarrow \quad (x-2)(x-3)$$

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

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

$$\frac{6x-18+2x+4}{(x-2)(x+2)(x-3)} = \frac{8x-14}{(x-2)(x+2)(x-3)}$$

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

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

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

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

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

$$9) \frac{4}{x^2-9} - \frac{3}{x^2+6x+9}$$

$$\frac{4}{(x-3)(x+3)} - \frac{3}{(x+3)(x+3)}$$

$$\text{LCD} = (x-3)(x+3)(x+3)$$

$$\frac{4(x+3) - 3(x-3)}{(x-3)(x+3)(x+3)}$$

$$\frac{4x+12-3x+9}{(x-3)(x+3)(x+3)} = \frac{(x+21)}{(x-3)(x+3)(x+3)}$$

$$10) \frac{5}{x-4} - \frac{3}{4-x}$$

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

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

$$\frac{5 - (-3)}{(x-4)} = \frac{8}{x-4}$$

$$11) \frac{3}{x+2} + 2$$

$$\frac{3}{x+2} + \frac{2}{1}$$

$$\text{LCD} = (x+2)$$

$$\frac{3}{(x+2)} + \frac{2(x+2)}{(x+2)}$$

$$\frac{3+2x+4}{(x+2)}$$

$$\frac{2x+7}{x+2}$$

$$12) \frac{4x}{2x-1} - \frac{5}{x-6}$$

$$\text{LCD} = (2x-1)(x-6)$$

$$\frac{4x(x-6)}{(2x-1)(x-6)} - \frac{5(2x-1)}{(x-6)(2x-1)}$$

$$\frac{4x^2-24x-10x+5}{(2x-1)(x-6)} = \frac{4x^2-34x+5}{(2x-1)(x-6)}$$

$$13) \frac{x+4}{2x} - \frac{x-1}{x^2}$$

$$\text{LCD} = 2x^2$$

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

$$\frac{x^2+4x-2x+2}{2x^2} = \frac{x^2+2x+2}{2x^2}$$

2 Challenge Problems:

$$14) \frac{3x+5}{x+5} - \frac{x+1}{2-x} - \frac{4x^2-3x-1}{x^2+3x-10} \quad \text{LCD} = (x+5)(x-2)$$

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

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

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

$$\frac{3x^2-x-10+x^2+6x+5-4x^2+3x+1}{(x+5)(x-2)} = \frac{8x-4}{(x+5)(x-2)} = \frac{4(2x-1)}{(x+5)(x-2)}$$

$$15) \frac{1}{x+1} + \frac{x}{x-6} - \frac{5x-2}{x^2-5x-6}$$

$$\text{LCD} = (x+1)(x-6)$$

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

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