

## Chapter 2: Algebraic Manipulation

1. Express  $\frac{2x+1}{3} - \frac{x-3}{2}$  as a single fraction in its lowest terms.

$$\frac{2x+1}{3} - \frac{x-3}{2} = \frac{2(2x+1) - 3(x-3)}{6} = \frac{4x+2-3x+9}{6} = \frac{x+11}{6}$$

2. Simplify  $\frac{2h+1}{2} - \frac{5h-2}{3}$

$$\frac{2h+1}{2} - \frac{5h-2}{3} = \frac{3(2h+1) - 2(5h-2)}{6} = \frac{6h+3-10h+4}{6} = \frac{-4h+7}{6}$$

3. Simplify  $\frac{2q-3}{2} - \frac{1-2q}{6}$

$$\frac{2q-3}{2} - \frac{1-2q}{6} = \frac{3(2q-3) - (1-2q)}{6} = \frac{6q-9-1+2q}{6} = \frac{8q-10}{6} = \frac{4q-5}{3}$$

4. Express  $\frac{2x+1}{2} - \frac{x-3}{3}$  as a single fraction in its lowest terms.

$$\frac{2x+1}{2} - \frac{x-3}{3} = \frac{3(2x+1) - 2(x-3)}{6} = \frac{6x+3-2x+6}{6} = \frac{4x+9}{6}$$

5. Express  $\frac{5}{3x} - \frac{1}{6x}$  as a single fraction in its simplest form.

$$\frac{5}{3x} - \frac{1}{6x} = \frac{2(5) - 1}{6x} = \frac{10-1}{6x} = \frac{9}{6x} = \frac{3}{2x}$$

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 $a^2 - b^2 = (a+b)(a-b)$

6. Express  $\frac{x+y}{x-y} - \frac{2}{x+y}$  as a single fraction in its simplest form.

$$\frac{x+y}{x-y} - \frac{2}{x+y} = \frac{(x+y)^2 - 2(x-y)}{(x-y)(x+y)} = \frac{x^2+2xy+y^2-2x+2y}{(x-y)(x+y)} = \frac{x^2+2xy+y^2-2x+2y}{(x-y)(x+y)}$$

$$\frac{x-y}{x+y} \cdot \frac{x-y, x+y}{1, x+y}$$

7. Express as a single fraction in its simplest form  $\frac{6}{2-x} + \frac{5}{4-x^2}$

$$\frac{6}{2-x} + \frac{5}{4-x^2} = \frac{6(2+x) + 5}{(2-x)(2+x)} = \frac{12+6x+5}{(2-x)(2+x)} = \frac{17+6x}{(2-x)(2+x)}$$

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

8. Simplify  $\frac{20}{x+2} - \frac{3}{x+2}$

$$\frac{20}{x+2} - \frac{3}{x+2} = \frac{20(x+2) - 3(x)}{(x+2)(x+2)} = \frac{20x+40-3x}{(x+2)(x+2)} = \frac{17x+40}{(x+2)(x+2)}$$

$$\frac{17x+40}{(x+2)(x+2)}$$

9. Express  $\frac{a+1}{a} - \frac{2}{a+1}$  as a single fraction in its simplest form.

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

$$\frac{a+1}{a+1} \cdot \frac{a, a+1}{1, a+1}$$

10. Simplify the following algebraic fractions

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

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

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

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

$$\frac{a}{a+1} \cdot \frac{a, a+1}{1, a+1}$$

$$\frac{23}{10(a+1)}$$

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$$\frac{x+1}{x-1} \cdot \frac{x+1, x-1}{1, x-1}$$

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