

Algebraic Manipulation and Formulae

1. Express each of the following as a single fraction in its simplest form.

(a) $\frac{6}{x-5} + \frac{4}{3x-15}$

(b) $\frac{8x}{6+x-x^2} - \frac{2x}{3-x}$

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

2. Simplify $\frac{x^2 - 81 - 4xy + 4y^2}{7x - 14y + 63}$.

3. Simplify $\frac{a^2 + 8ab + 3a + 12b + 16b^2}{ac - 3ad + 4bc - 12bd}$.

Algebraic Manipulation and Formulae

1. (a) $\frac{6}{x-5} + \frac{4}{3x-15} = \frac{6}{x-5} + \frac{4}{3(x-5)}$
 $= \frac{3(6) + 4}{3(x-5)}$
 $= \frac{22}{3(x-5)}$
- (b) $\frac{8x}{6+x-x^2} - \frac{2x}{3-x} = \frac{8x}{(3-x)(2+x)} - \frac{2x}{3-x}$
 $= \frac{8x - 2x(2+x)}{(3-x)(2+x)}$
 $= \frac{8x - 4x - 2x^2}{(3-x)(2+x)}$
 $= \frac{4x - 2x^2}{(3-x)(2+x)}$
 $= \frac{2x(2-x)}{(3-x)(2+x)}$
- (c) $\frac{3}{x-1} - \frac{4}{3x+2} + \frac{5}{3x^2-x-2} = \frac{3}{x-1} - \frac{4}{3x+2} + \frac{5}{(x-1)(3x+2)}$
 $= \frac{3(3x+2) - 4(x-1) + 5}{(x-1)(3x+2)}$
 $= \frac{9x + 6 - 4x + 4 + 5}{(x-1)(3x+2)}$
 $= \frac{5x + 15}{(x-1)(3x+2)}$
 $= \frac{5(x+3)}{(x-1)(3x+2)}$
2. $\frac{x^2 - 81 - 4xy + 4y^2}{7x - 14y + 63} = \frac{x^2 - 4xy + 4y^2 - 81}{7(x-2y+9)}$
 $= \frac{(x-2y)(x-2y) - 9^2}{7(x-2y+9)}$
 $= \frac{[(x-2y) - 9][(x-2y) + 9]}{7(x-2y+9)}$
 $= \frac{(x-2y-9)(x-2y+9)}{7(x-2y+9)}$
 $= \frac{x-2y-9}{7}$
3. $\frac{a^2 + 8ab + 3a + 12b + 16b^2}{ac - 3ad + 4bc - 12bd} = \frac{a^2 + 8ab + 16b^2 + 3a + 12b}{a(c-3d) + 4b(c-3d)}$
 $= \frac{(a+4b)^2 + 3(a+4b)}{(c-3d)(a+4b)}$
 $= \frac{(a+4b)(a+4b+3)}{(c-3d)(a+4b)}$
 $= \frac{a+4b+3}{c-3d}$

Adapted:

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