

MCR3U FACTORING - SIMPLIFYING PRACTICE

$$\begin{aligned} &= (3x-5)(3x-5) \\ &= 9x^2 - 30x + 25 \end{aligned}$$

1. Expand and Simplify

a) $(3a-4b)(2a-5ab+3b)$

b) $(3x-5)^2$

c) $(2x+3)^3 = (2x+3)(2x+3)$

$$= 6a^2 - 15a^2b + 9ab - 8ab + 20ab^2 - 12b^2$$

$$= 4x^2 + 6x + 6x + 9$$

$$= 4x^2 + 12x + 9$$

$$= 6a^2 - 15a^2b + ab + 20ab^2 - 12b^2$$

2. Factor by grouping

a) $3m^3 - 15m^2 - 2m + 10$

b) $x^2 - 10x + 25 - 4y^2$ (hint - square minus square)

$$= 3m^2(m-5) - 2(m-5)$$

$$= (x-5)^2 - 4y^2$$

$$= (m-5)(3m^2 - 2)$$

$$= ((x-5) - 2y)((x-5) + 2y)$$

a) $\frac{x^2 - 7x - 60}{x^2 - 4} \times \frac{14 - 7x}{(x-12)^2}$

b) $\frac{-3x^2 + 108}{3x^2 + 2x - 5} \times \frac{3x^2 + x - 10}{x^2 + 8x + 12}$

$$= \frac{(\cancel{x-12})(x+5)}{(\cancel{x-2})(x+2)} \times \frac{7(\cancel{2-x})}{(x-12)^2}$$

$$= \frac{-3(x^2 - 36)}{(3x+5)(x-1)} \times \frac{(3x+5)(x-2)}{(x+6)(x+2)}$$

$$= \frac{-7(x+5)}{(x+2)(x-12)}$$

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

restriction
 $x \neq 1, -2,$
 $-\frac{5}{3}, -6$

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

rest.
 $x \neq 2, -2, 12$

$$c) \frac{x^2 - 10x + 25}{2x^2 - 11x + 5} \div \frac{x^2 + 7x + 12}{2x^2 + 5x - 3}$$

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

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

$$= \frac{x-5}{x+4} \quad \square$$

restriction

$$x \neq 5, \frac{1}{2}, -3, -4$$

$$\begin{array}{r|l} x & + \\ 25 & -10 \\ \hline & -5, -5 \end{array}$$

$$\begin{array}{r|l} x & + \\ (2)(5) & -11 \\ \hline & 10, -10, -1 \end{array}$$

$$= 2x^2 - 10x - 1x + 5 = 2x(x-5) - 1(x-5) = (x-5)(2x-1)$$

$$\begin{array}{r|l} x & + \\ 12 & 7 \\ \hline & 3, 4 \end{array}$$

$$\begin{array}{r|l} x & + \\ -6 & +5 \end{array} \quad +6, -1$$

$$= 2x^2 + 6x - 1x - 3 = 2x(x+3) - 1(x+3) = (x+3)(2x-1)$$

$$2x-1 \neq 0$$

$$2x \neq 1$$

$$x \neq \frac{1}{2}$$

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

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

Needs "x-2"

restrictions

$$x \neq -3, 2, 1$$

Common denominator

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

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

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

simplify by collecting like terms!

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

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

"might" factor - doesn't in this case

DON'T EXPAND!

expand the NUMERATOR
LEAVE THE DENOM. IN FACTORED FORM!!!!

$$e) \frac{2}{x^2 + 4x - 60} - \frac{3}{x^2 - 36}$$

restrictions: $x \neq -10, 6, -6$

$$= \frac{2}{(x+10)(x-6)} - \frac{3}{(x-6)(x+6)}$$

C.D.

$$\underbrace{(x+10)(x-6)}_{\text{red}} \underbrace{(x+6)}_{\text{purple}}$$

$$= \frac{2(x+6)}{(x+10)(x-6)(x+6)} - \frac{3(x+10)}{(x-6)(x+6)(x+10)}$$

$$= \frac{2(x+6) - 3(x+10)}{(x+10)(x-6)(x+6)}$$

$$= \frac{2x + 12 - 3x - 30}{(x+10)(x-6)(x+6)} = \frac{-x - 18}{(x+10)(x-6)(x+6)}$$

$$f) \frac{2x}{x^2 - x - 2} + \frac{x^2 + 3x - 10}{x^2 - 5x + 6} \times \frac{3x + 12}{x^2 + 2x - 8}$$

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

restrictions
 $x \neq 2, -1, 3, -4$

$$= \frac{2x}{(x+2)(x+1)} + \frac{3(x+5)}{(x-3)(x-2)} \quad \underline{CD}$$

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

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

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

$$= \frac{2x^3 - 10x^2 + 12x + 3(x^3 + 3x^2 + 6 + 5x^2 + 15x + 10)}{(x+2)(x+1)(x-3)(x-2)}$$

$$= \frac{2x^3 - 10x^2 + 12x + 3x^3 + 9x^2 + 18 + 15x^2 + 45x + 30}{(x+2)(x+1)(x-3)(x-2)}$$

$$= \frac{5x^3 + 14x^2 + 57x + 48}{(x+2)(x+1)(x-3)(x-2)}$$