

MIDTERM REVIEW - FACTORING

1. Expand and Simplify :

$$\begin{aligned} \text{a) } (2x - 5)^2 - 3(x + 1) &= 4x^2 - 20x + 25 - 3x - 3 \\ &= \boxed{4x^2 - 23x + 22} \end{aligned}$$

$$\begin{aligned} \text{b) } (x - 2)(x + 5) - (4x - 5)(2x - 1) &= x^2 + 5x - 2x - 10 - (8x^2 - 4x - 10x + 5) \\ &= x^2 + 3x - 10 - 8x^2 + 14x - 5 \\ &= \boxed{-7x^2 + 17x - 15} \end{aligned}$$

$$\begin{aligned} \text{c) } 3 - 2(x - 4) - (x + 5)(6x - 1) &= 3 - 2x + 8 - (6x^2 - x + 30x - 5) \\ &= 11 - 2x - 6x^2 - 29x + 5 \\ &= \boxed{-6x^2 - 31x + 16} \end{aligned}$$

$$\begin{aligned} \text{d) } (3x - 4)(3x + 4) - (4x - 5)^2 &= 9x^2 - 16 - (16x^2 - 40x + 25) \\ &= 9x^2 - 16 - 16x^2 + 40x + 25 \\ &= \boxed{-7x^2 + 40x + 9} \end{aligned}$$

$$\begin{aligned} \text{e) } (3x - 5)(2x - 4)(5x - 1) &= (3x - 5)(10x^2 - 2x - 20x + 4) = 30x^3 - 66x^2 + 12x - 50x^2 + 110x - 20 \\ &= (3x - 5)(10x^2 - 22x + 4) = \boxed{30x^3 - 116x^2 + 122x - 20} \end{aligned}$$

2. Factor as much as possible:

$$\text{a) } x^2 - 4x - 5 = \boxed{(x - 5)(x + 1)}$$

$\begin{matrix} \otimes -5 \\ \oplus -4 \end{matrix} \left. \vphantom{\begin{matrix} \otimes -5 \\ \oplus -4 \end{matrix}} \right\} -5 \neq 1$

$$\text{b) } 16x^2 - 40x + 25 = \boxed{(4x - 5)^2}$$

$\begin{matrix} \downarrow & & \uparrow \\ (4x)^2 & & 5^2 \\ & DP \checkmark & \end{matrix}$

$$\begin{aligned} \text{c) } 6x^2 + x - 2 &= 6x^2 + 4x - 3x - 2 = \boxed{(2x - 1)(3x + 2)} \\ &= 2x(3x + 2) - 1(3x + 2) \end{aligned}$$

$\begin{matrix} \otimes -12 \\ \oplus 1 \end{matrix} \left. \vphantom{\begin{matrix} \otimes -12 \\ \oplus 1 \end{matrix}} \right\} 4 \neq -3$

$$\text{d) } 49x^2 - 81 = \boxed{(7x + 9)(7x - 9)}$$

$$\text{e) } 0.25x^2 - 0.04 = \frac{1}{4}x^2 - \frac{1}{25} = \boxed{\left(\frac{1}{2}x + \frac{1}{5}\right)\left(\frac{1}{2}x - \frac{1}{5}\right)}$$

$$\begin{aligned} \text{f) } (x - 3)^2(2x + 1)^2 - 5(2x + 1)(x - 3)^2 \\ &= (x - 3)^2(2x + 1) \left[2x + 1 - 5 \right] \\ &= (x - 3)^2(2x + 1)(2x - 4) \end{aligned}$$

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

$$\begin{aligned} \text{g) } 5x^3(x-3)^3 - 25x^2(x-3)^4 &= 5x^2(x-3)^3 \left[x - 5(x-3) \right] \\ &= \boxed{5x^2(x-3)^3(-4x+15)} \end{aligned}$$

$$\begin{aligned} \text{h) } 15(x-y)^2 - 8x + 8y \\ &= 15(x-y)^2 - 8(x-y) \\ &= (x-y) \left[15(x-y) - 8 \right] \\ &= \boxed{(x-y)(15x - 15y - 8)} \end{aligned}$$

$$\text{i) } (2x+3)^2 - 4(2x+3) - 12$$

$$\begin{aligned} \text{let } t &= 2x+3 & t^2 - 4t - 12 \\ & & (t-6)(t+2) \\ & & = (2x+3-6)(2x+3+2) \end{aligned}$$

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

$$\text{j) } 6(x+2)^2 - 11(x+2) - 7$$

$$\begin{aligned} \text{let } t &= x+2 & 6t^2 - 11t - 7 \\ \left. \begin{array}{l} \otimes -42 \\ \oplus -11 \end{array} \right\} -14 \div 3 & & 6t^2 - 14t + 3t - 7 \\ & & 2t(3t-7) + 1(3t-7) \\ & & (2t+1)(3t-7) \\ & & = (2(x+2)+1)(3(x+2)-7) \end{aligned}$$

$$\begin{aligned} &= (2x+4+1)(3x+6-7) \\ &= \boxed{(2x+5)(3x-1)} \end{aligned}$$

$$\text{k) } 3(x+5)^2 - 23(x+5) + 20$$

$$\begin{aligned} \text{let } t &= x+5 & 3t^2 - 23t + 20 \\ \left. \begin{array}{l} \otimes 60 \\ \oplus -23 \end{array} \right\} -20 \div -3 & & 3t^2 - 3t - 20t + 20 \\ & & 3t(t-1) - 20(t-1) \\ & & (3t-20)(t-1) \\ & & = (3(x+5)-20)(x+5-1) \end{aligned}$$

$$= (3x+15-20)(x+4)$$

$$= \boxed{(3x-5)(x+4)}$$

$$\text{l) } (x^2-9)^2 - 16(x+3)^2$$

$$\begin{aligned} &= (x+3)^2(x-3)^2 - 16(x+3)^2 \\ &= (x+3)^2 \left[(x-3)^2 - 16 \right] \end{aligned}$$

$$= (x+3)^2 (x-3+4)(x-3-4)$$

$$= \boxed{(x+3)^2(x+1)(x-7)}$$

$$\text{m) } 4(x-5)^2 - 9(x+1)^2$$

$$= (2(x-5)+3(x+1))(2(x-5)-3(x+1))$$

$$= (2x-10+3x+3)(2x-10-3x-3)$$

$$= \boxed{(5x-7)(-x-13)}$$