

$$= (3x+y)(7xy-4)$$

$$\begin{aligned} \text{iii) } 3x^3 - 2y^3 - 6x^2y^2 + xy &= 3x^3 + xy - 2y^3 - 6x^2y^2 = \\ &= x(3x^2 + y) + 2y^2(-y - 3x^2) = x(3x^2 + y) - 2y^2(y + 3x^2) = \\ &= x \underbrace{(3x^2 + y)}_w - 2y^2 \underbrace{(3x^2 + y)}_w = xw - 2y^2w = w(x - 2y^2) = \\ &= (3x^2 + y)(x - 2y^2) \end{aligned}$$

$$\begin{aligned} \text{iv) } \alpha x^2 + \alpha y^2 - \beta x^2 - \beta y^2 + \beta - \alpha &= \\ &= \alpha x^2 + \alpha y^2 - \alpha - \beta x^2 - \beta y^2 + \beta = \\ &= \alpha(x^2 + y^2 - 1) + \beta(-x^2 - y^2 + 1) = \\ &= \alpha \underbrace{(x^2 + y^2 - 1)}_w - \beta \underbrace{(x^2 + y^2 - 1)}_w = \alpha w - \beta w = w(\alpha - \beta) = \\ &= (x^2 + y^2 - 1)(\alpha - \beta) \end{aligned}$$

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

$$\text{ii) } 25x^2 - 49 = 5^2 \cdot x^2 - 7^2 = (5x)^2 - 7^2 = (5x-7)(5x+7)$$

$$\begin{aligned} \text{iii) } \frac{1}{\alpha^2} - \frac{100}{\beta^4} &= \frac{1^2}{\alpha^2} - \frac{10^2}{(\beta^2)^2} = \left(\frac{1}{\alpha}\right)^2 - \left(\frac{10}{\beta^2}\right)^2 = \\ &= \left(\frac{1}{\alpha} - \frac{10}{\beta^2}\right) \left(\frac{1}{\alpha} + \frac{10}{\beta^2}\right) \end{aligned}$$

$$\begin{aligned} \text{iv) } (3k+1)^2 - 9k^2 &= (3k+1)^2 - 3^2 \cdot k^2 = (3k+1)^2 - (3k)^2 = \\ &= [(3k+1) - 3k] \cdot [(3k+1) + 3k] = (3k+1-3k) \cdot (3k+1+3k) = \\ &= 1 \cdot (6k+1) = 6k+1 \end{aligned}$$