3rd exercise:

1)a- $P(x) = 4(x-3)^2 - (x+1)^2$

$P(x) = [2(x-3)]^2 - (x+1)^2$ which is of the form $a^2 - b^2$.

$P(x) = [2(x-3) - (x+1)][2(x-3) + (x+1)]$

$\therefore \boxed{P(x) = [x-7][3x-5]}$

b- $Q(x) = (x-7)^2 - (x+1)(7-x) - 49 + x^2$.

$= (x-7)^2 + (x+1)(x-7) + (x^2 - 7^2)$

$= (x-7)^2 + (x+1)(x-7) + (x-7)(x+7)$

$= (x-7)[(x-7) + (x+1) + (x+7)]$

$\therefore \boxed{Q(x) = (x-7)(3x+1)}$

c- $Q(-\frac{1}{3}) = (-\frac{1}{3} - 7)(3(-\frac{1}{3}) + 1)$

$= (-\frac{1}{3} - 7)(0)$

$\therefore Q(-\frac{1}{3}) = 0$.

now, $P(-\sqrt{2}) = (-\sqrt{2} - 7)(3(-\sqrt{2}) - 5)$

$= +6 + 5\sqrt{2} + 21\sqrt{2} + 35$

$P(-\sqrt{2}) = 41 + 26\sqrt{2}$.

$\therefore Q(-\frac{1}{3}) + 110 > P(-\sqrt{2})$

2)a- $P(x) = (x-7)(3x-5)$

$= 3x^2 - 5x - 21x + 35$

$\therefore \boxed{P(x) = 3x^2 - 26x + 35}$ where $a = 3$; $b = -26$ & $c = 35$