## Example 2

Write the quadratic equation $x^2 + 4x + 1$ in the form $(x - p)^2 + q$ and hence,

(i) find the minimum point and minimum value of $x^2 + 4x + 1$

(ii) solve the equation $x^2 + 4x + 1 = 0$, leaving your answer in surd form.

vertex form

(Hence)

(i) Vertex form?

$(a+b)^2 = a^2 + 2ab + b^2$

related perfect square

$a = x$

$b = 2$ $\quad b^2 = 4$

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

$x^2 + 4x + 1$

$x^2 + 4x + 4 - 4 + 1$

$(x+2)^2 - 3$

min: $(-2, -3)$

(ii) Hence Solve

vertex form

$x^2 + 4x + 1 = 0$

$(x+2)^2 - 3 = 0$

$(x+2)^2 = 3$

$x + 2 = \pm\sqrt{3}$

$x = -2 \pm \sqrt{3}$

6(i) Express $2x^2 - 12x + 7$ in the form $a(x - b)^2 + c$.

(ii) What is the min. pt.

(iii) Hence Solve when expression = 0

$(a+b)^2 = a^2 + 2ab + b^2$

related Perfect Square

$a = x$

$b = -3$ $\quad b^2 = 9$

$(x-3)^2 = x^2 - 6x + 9$

Solve $\Rightarrow$

(i) $2x^2 - 12x + 7$

$2[x^2 - 6x + \frac{7}{2}]$

$2[x^2 - 6x + 9 - 9 + \frac{7}{2}]$

$2[(x-3)^2 - \frac{11}{2}]$

$2(x-3)^2 - 11$

(ii) min. pt. $(3, -11)$

(iii) $2x^2 - 12x + 7 = 0$

$2(x-3)^2 - 11 = 0$

$2(x-3)^2 = 11$

$(x-3)^2 = \frac{11}{2}$

$x - 3 = \pm\sqrt{\frac{11}{2}}$

$x = 3 \pm \sqrt{\frac{11}{2}}$