

Quadratics – Q3 [Practice/E] (16/6/21)

Derive the quadratic formula for the equation

$ax^2 + bx + c = 0$, by completing the square

Solution

$$\text{First of all, } a \left(x^2 + \left(\frac{b}{a} \right) x + \frac{c}{a} \right) = 0$$

$$\rightarrow x^2 + \left(\frac{b}{a} \right) x + \frac{c}{a} = 0$$

$$\rightarrow \left(x + \frac{b}{2a} \right)^2 - \left(\frac{b}{2a} \right)^2 + \frac{c}{a} = 0$$

$$\rightarrow \left(x + \frac{b}{2a} \right)^2 = \left(\frac{b}{2a} \right)^2 - \frac{c}{a} = \frac{b^2 - 4ac}{4a^2}$$

$$\rightarrow (2ax + b)^2 = b^2 - 4ac$$

$$\rightarrow 2ax + b = \pm \sqrt{b^2 - 4ac}$$

$$\rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$