Mathematics 10D

6.4 – Proof of Quadratic Formula

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Solving from vertex form:

$$\overset{+32}{0} = 2(x-5)^2 - 32 \quad {+32}$$

$$\frac{32}{2} = \frac{2(x-5)^2}{2}$$

$$\sqrt{16} = \sqrt{(x-5)^2}$$

$$\pm 4^{+5} = x - 5 \quad {+5}$$

$$x = 9 \text{ and } x = 1$$

$$\sqrt{16} = 4, \quad 4 \times 4 = 16$$

$$-4 \times -4 = 16$$

$$0 = ax^2 + bx + c \rightsquigarrow x = ??$$

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

$$\left(\frac{b}{2a}\right)^2 = \frac{b^2}{4a^2}$$

$$0 = a\left(\underbrace{x^2 + \frac{b}{a}x + \frac{b^2}{4a^2}} - \frac{b^2}{4a^2}\right) + c$$

$$0 = a\left(x + \frac{b}{2a}\right)^2 + c - \frac{\cancel{a}b^2}{4a^{\cancel{2}}}$$

vertex

$$\left(\frac{-b}{2a}, c - \frac{b^2}{4a}\right)$$

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

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

$4a$

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

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

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

$$y = ax^2 + bx + c$$