

Mathematics 10D

6.4 – Proof of Quadratic Formula

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Solving from vertex form:

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

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

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

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

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

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

$$4 \times 4 = 16$$

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

$$0 = \underline{a}x^2 + \underline{b}x + \underline{c} \leadsto x = ??$$

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

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

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

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

vertex

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

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

Diagram showing the cancellation of 'a' from the numerator and denominator of the right-hand side. A red line is drawn under the 'a' in the denominator, and a green arrow points from the 'a' in the numerator to the 'a' in the denominator.

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

Diagram showing the cancellation of 'a' from the denominator of the second term on the left-hand side. A green arrow points from the 'a' in the denominator to the 'a' in the denominator of the first term.

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

Diagram showing the simplification of the square root. A red '+' sign is written next to the square root symbol on the left-hand side. A blue line is drawn around the entire expression.

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


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

$$y = \underline{a}x^2 + \underline{b}x + \underline{c}$$