Polynomials - Quadratic

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Consider the quadratic polynomial

$$f(x) = ax^2 + bx + c$$

where $a \neq 0$, then

$$f(x) = ax^2 + bx + c$$

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

$$= a\left[\left(x + \frac{b}{2a} \right)^2 - \left(\frac{b}{2a} \right)^2 + \frac{c}{a} \right] \qquad \text{(completing the square)}$$

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

Quadratic Equations

For $f(x) = ax^2 + bx + c = 0$, we have

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

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