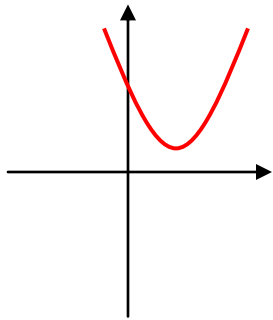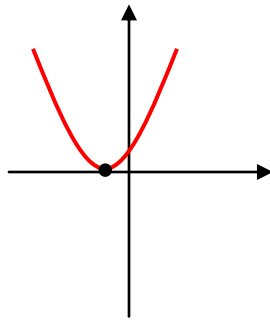# 20.1 The Basics of Solving Quadratic Equations
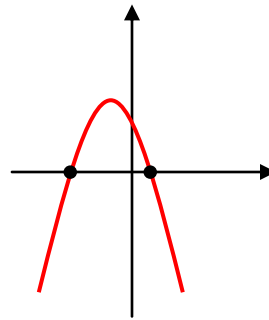
The Graph of a Quadratic Function

No *x*-intercepts
No real-number roots

One *x*-intercept
One real-number root

Two *x*-intercepts
Two real-number roots

❖ **Square Root Property**

> **Square Root Property (The Principle of Square Roots)**
> For any real number k, if $x^2 = k$, then $x = \sqrt{k}$ or $x = -\sqrt{k}$.

Ex. Solve. Give the exact solutions and approximate solutions to three decimal places, when appropriate.

(a) $4x^2 = 27$ (b) $9x^2 - 6 = -22$

(c) $(x-1)^2 = 49$ (d) $(x+3)^2 = 20$

❖ **Completing the Square**

By using *completing the square*, we can use <u>square root property</u> to solve ***any*** quadratic equation.

> **To complete the square for** $x^2 + bx$, **we** <u>**add**</u> $\left(\dfrac{b}{2}\right)^2$.

$$x^2 + bx + \left(\frac{b}{2}\right)^2 \Rightarrow \left(x + \frac{b}{2}\right)^2$$

Ex. Solve by completing the square.

(a) $x^2 + 8x = 9$

(b) $x^2 + 23 = 10x$

(c) $x^2 + 4x + 13 = 0$

(d) $3x^2 + 5x - 2 = 0$

Ex. Find the x-intercepts of each function.

(a) $f(x) = x^2 + 8x - 9$

(b) $f(x) = x^2 - 10x + 23$

(c) $f(x) = x^2 + 4x + 13$

(d) $f(x) = 3x^2 + 5x - 2$