Section 2.5 Quadratic Equations and Models

Theorem

ZERO PRODUCT PROPERTY

If m and n are complex numbers, then

$$m \cdot n = 0 \quad \text{if and only if} \quad m = 0 \text{ or } n = 0 \text{ (or both)}$$

Example

Solving Quadratic Equations by Factoring

Solve by factoring:

$$(x - 5)(x + 3) = 0$$
$$x^2 - 6x + 5 = -4$$

Example

Solve by completing the square:

(A) $x^2 + 8x - 3 = 0$ (B) $3x^2 - 12x + 13 = 0$

THEOREM 1 Quadratic Formula

If $ax^2 + bx + c = 0, a \neq 0$, then

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

Example

Solve $x^2 - \frac{5}{2} = -3x$ using the quadratic formula. Leave the answer in simplest radical form.

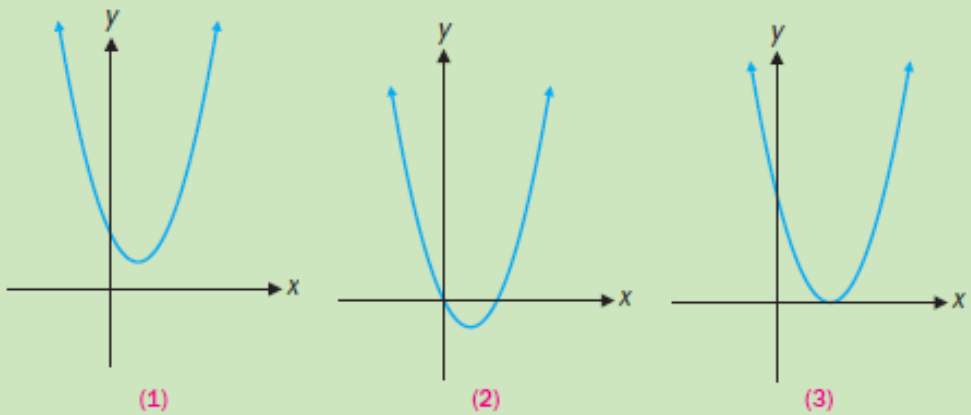
$D = b^2 - 4ac$ is called the **discriminant**

Given the quadratic function $f(x) = ax^2 + bx + c$, let $D = b^2 - 4ac$. How many real zeros does f have if

(A) $D > 0$ **(B)** $D = 0$ **(C)** $D < 0$

In each of these three cases, what type of roots does the quadratic equation $f(x) = 0$ have?

Match each of the three cases with one of the following graphs.



Example

Find the number of solution of the equation $x^2 - 5x + 1 = 0$