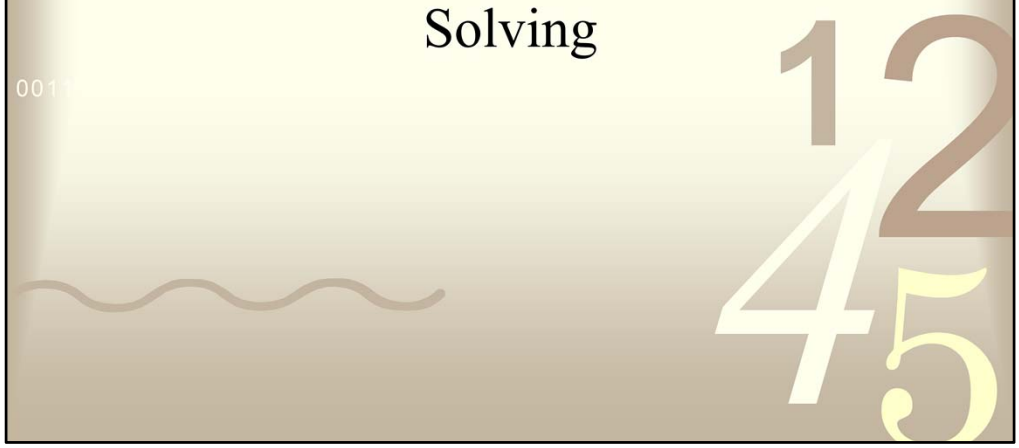
3.2 Quadratic Equations & Problem Solving



Solving Quadratics by Factoring

Factor

$$ax^2 + bx + c = 0$$

completely, then set each factor to zero and solve for x. For help with factoring, see my website under the "General Handouts" link.

Note: This corresponds to finding the x-intercepts on the graph!

Solving Quadratics by Completing the Square

- Follow the guidelines from the last section for completing the square.
- Isolate the squared term on one side of the equation.
- Square root both sides and solve for x.

Quadratic Formula

If we complete the square on the general equation $ax^2 + bx + c = 0$, we find a formula for the solutions. The quadratic formula is

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

Examples

- Solve $x(5x+19)=4$
- Solve $9x^2-11=0$
- Solve $-3(x+5)^2-6=0$
- Solve $-0.1x^2+1=0.5x$

Discriminant

In the quadratic formula, $b^2 - 4ac$ is called the discriminant.

- If $b^2 - 4ac > 0$, there are two real solutions and, hence, two x-intercepts
- If $b^2 - 4ac = 0$, there is one real solution and, hence, one x-intercept
- If $b^2 - 4ac < 0$, there are no real solutions and, hence, no x-intercepts

Examples

Calculate the discriminant and use it to determine the number of real solutions to the equation:

a. $3x^2 - 2 = 5x$

b. $4x = 6 + x^2$

Domain

Recall, if our function is an algebraic fraction, the domain will be the values of x for which the denominator does not equal zero.

Example: Find the domain of the function

a. $f(x) = \dfrac{4x}{7 - x^2}$

b. $g(t) = \dfrac{t + 1}{2t^2 - 11t - 21}$