

## Math 1050 ~ College Algebra

### 6.5 Supplemental Video

**Learning Objectives**

- Practice completing the square.
- Develop the quadratic formula.
- Develop the formula for the vertex of a quadratic function.

$$\begin{aligned} -3x + 4y &= 5 \\ 2x - y &= -10 \end{aligned}$$

$$\begin{bmatrix} -3 & 4 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ -10 \end{bmatrix}$$

$$\sum_{k=1}^m k = \frac{m(m+1)}{2}$$

$$\sum_{k=0}^n z^k = \frac{1-z^{n+1}}{1-z}$$

### **Completing the Square**

For a good explanation of how to complete the square, see

<http://www.mathsisfun.com/algebra/completing-square.html>

This is useful in solving a quadratic equation and in putting that equation in standard form.

Ex 1: Solve by completing the square.

a)  $x^2 - 6x - 3 = 0$       b)  $3x^2 - 6x - 9 = 0$       c)  $2x^2 - 5x + 4 = 0$

Ex 2: Put these equations in standard form.  $y = a(x-h)^2 + k$

a)  $y = x^2 + 2x - 2$       b)  $y = 2x^2 - 4x - 3$       c)  $y = -\frac{1}{2}x^2 - 3x + 5$

### Deriving the Quadratic Formula

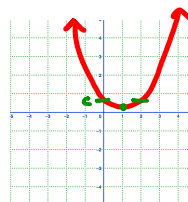
If  $ax^2 + bx + c = 0$ ,  $a \neq 0$ , then  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ .

Ex 3: Solve this equation for  $x$ , if  $a$ ,  $b$  and  $c$  are constants.

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

### Deriving the Formula for the Vertex

The vertex of  $f(x) = ax^2 + bx + c$  is at the point  $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$ .



Ex 4: Determine the vertex for each of these using the above method.

a)  $y = x^2 + 2x - 2$

b)  $y = 2x^2 - 6x - 3$

c)  $y = -\frac{1}{2}x^2 - 3x + 5$