Completing the Square – Part 2

Yesterday we looked at how to convert quadratic relations from standard form into vertex form, algebraically, using the process of completing the square. Yesterday we focused on examples where $a = 1$. Today we will focus on examples where $a \neq 1$.

To Complete the Square for $ax^2 + bx + c$ when $a \neq 1$:

1. Remove a common factor of a from the first two terms → $a\left(x^2 + \frac{b}{a}x\right) + c$

2. Inside the brackets → separate the middle term into two equal parts
   → add and subtract the square of the equal part
   → factor the perfect square portion (the first four terms)

3. Distribute a to the perfect square and to the "fifth term" in the brackets.

4. Simplify the constants (collect like terms).

Example - Complete the square for each of the quadratic relations below.
Then state the vertex of each quadratic relation.

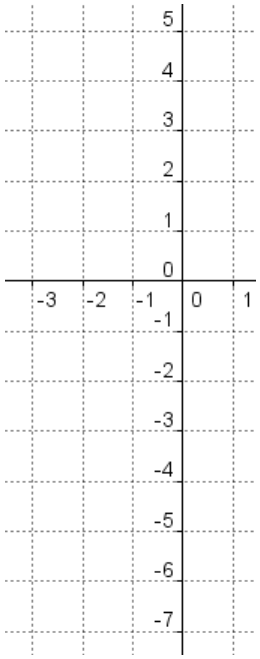
a. $y = 4x^2 + 24x + 18$

b. $y = -x^2 - 10x + 2$

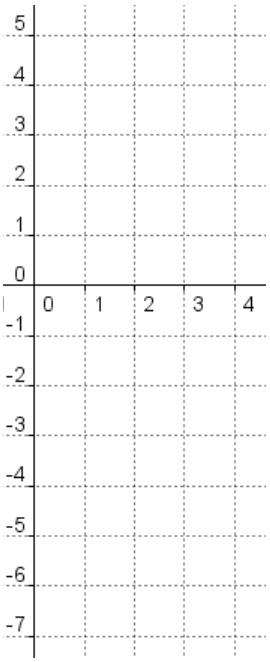
c. $y = -\frac{1}{2}x^2 + 4x + 12$

Example - Complete the square and graph each of the quadratic relations below.

a. $y = 2x^2 + 4x - 3$



b. $y = -3x^2 + 12x - 7$



Homework – Please complete the question below and #7, 8 and 10 on page 270.

1. Consider the quadratic relation $y = -4x^2 - 24x - 11$ given in standard form.

   a) Convert this equation to vertex form by completing the square.
   b) Convert this equation to factored form by factoring.
   c) State the step pattern for this quadratic relation.
   d) Graph this quadratic relation. Label the coordinates of the x-intercepts, y-intercept, vertex and all points that follow the step pattern.