Vertex Form of a Quadratic Equation

Any quadratic function $f(x) = ax^2 + bx + c$, $a \neq 0$, can be written in the vertex form

$$f(x) = a(x - h)^2 + k$$

The graph of f is a parabola with vertex (h,k) and axis $x = h$, where $h = -b/(2a)$ and $k = c - ah^2$. If $a>0$, the parabola opens upward, and if $a<0$, it opens downward.

Use the vertex form of a quadratic function to find the vertex and axis of the graph of $f(x) = 2x^2 - 8x + 11$. Rewrite the equation in vertex form.

Finding Vertex form by completing the square:

1. Change f(x) to y and/or put in standard form.

2. Move constant to side with y

3. Be sure that "a" =1, if not divide both sides by a (every term)

4. Complete the square on the side w/ the x^2 and x terms (be sure to keep equation balanced)

5. Make adjustments using Algebra to get the vertex from $y = a(x-h)^2 + k$

$$y = 2x^2 - 8x + 11$$

$$y - 11 = 2x^2 - 8x$$

$$\frac{y-11}{2} = x^2 - 4x$$

$$\frac{y-11}{2} + 4 = x^2 - 4x + 4$$

$$\frac{y-11}{2} = (x-2)^2$$

$$y - 11 = 2(x-2)^2$$

$$y = 2(x-2)^2 + 11$$

Point of View	**Characterization**
Verbal	polynomial of degree 2
Algebraic	$f(x) = ax^2 + bx + c$ or $f(x) = a(x - h)^2 + k \quad (a \neq 0)$
Graphical	parabola with vertex (h, k) and axis $x = h$; opens upward if $a > 0$, opens downward if $a < 0$; initial value = y-intercept = $f(0) = c$ x-intercepts = $\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Vertical Free-Fall Motion

The **height** s and vertical **velocity** v of an object in free fall are given by

$s(t) = -\frac{1}{2}gt^2 + v_0 t + s_0$ and $v(t) = -gt + v_0$,

where t is time (in seconds), $g \approx 32$ ft/sec^2 ≈ 9.8 m/sec^2 is the **acceleration due to gravity**, v_0 is the *initial vertical velocity* of the object, and s_0 is its *initial height*.

#31 1.7

$10\% = x \Rightarrow$ # gal

$45\% = y$

} 100 gal $\Rightarrow$ 25% sol

$x + y = 100$

$.1x + .45y = .25(100)$

$10x + 45y = 2500$

$y = 100 - x$