

2. Vertex Form of a Quadratic Function:

$y = a(x - h)^2 + k$ vertex: (h, k) (inside _____, outside _____)

<p>Write a Quadratic Equation in Vertex Form by Completing the Square</p> <ol style="list-style-type: none"> 1. Move the constant to the y side to make room for plus the magic number. 2. Factor out the GCF 3. Complete the square and write it in factored form. 4. Identify the vertex, (h, k) 		$y = x^2 + 10x - 3$ $y + 3 = x^2 + 10x$ $y + 3 + 25 = x^2 + 10x + 25$ $y + 28 = (x + 5)^2$ $y = (x + 5)^2 - 28$ <p>vertex = $(-5, -28)$</p>
$y = x^2 - 16x + 4$ $y - 4 = x^2 - 16x$ $y - 4 + 64 = x^2 - 16x + 64$ $y + 60 = (x - 8)^2$ $y = (x - 8)^2 - 60$ <p>Vertex = $(8, -60)$</p>	$y = x^2 - 7x$ $y + \frac{49}{4} = x^2 - 7x + \frac{49}{4}$ $y + \frac{49}{4} = (x - 7/2)^2$ $y = (x - 7/2)^2 - 49/4$ <p>Vertex = $(7/2, -49/4)$</p>	$y = 2x^2 - 8x + 5$ $y - 5 = 2x^2 - 8x$ $\frac{y - 5}{2} = x^2 - 4x$ $\frac{y - 5}{2} + 4 = x^2 - 4x + 4$ $\frac{y - 5}{2} + 4 = (x - 2)^2$ $\frac{y - 5}{2} = (x - 2)^2 - 4$ $y - 5 = 2(x - 2)^2 - 8$ <p>vertex $(2, -3)$</p>
$y = 3x^2 + 12x - 1$ $y + 1 = 3x^2 + 12x$ $\frac{y + 1}{3} = x^2 + 4x$ $\frac{y + 1}{3} + 4 = x^2 + 4x + 4$ $\frac{y + 1}{3} + 4 = (x + 2)^2$ $\frac{y + 1}{3} = (x + 2)^2 - 4$ $y + 1 = 3(x + 2)^2 - 12$	$y = -4x^2 - 16x + 7$ $y - 7 = -4x^2 - 16x$ $\frac{y - 7}{-4} = x^2 + 4x$ $\frac{y - 7}{-4} + 4 = x^2 + 4x + 4$ $\frac{y - 7}{-4} + 4 = (x + 2)^2$ $\frac{y - 7}{-4} = (x + 2)^2 - 4$ $y - 7 = -4(x + 2)^2 + 16$	$y = -x^2 - 24x - 9$ $\frac{y + 9}{-1} = x^2 + 24x$ $\frac{y + 9}{-1} + 144 = x^2 + 24x + 144$ $\frac{y + 9}{-1} + 144 = (x + 12)^2$ $\frac{y + 9}{-1} = (x + 12)^2 - 144$ $y + 9 = -(x + 12)^2 + 144$ $y = -(x + 12)^2 + 135$
$y = -x^2 - x + 3$ $-y = x^2 + x - 3$ $-y + 3 = x^2 + x$ $-y + 3 + \frac{1}{4} = x^2 + x + \frac{1}{4}$ $-y + \frac{13}{4} = (x + 1/2)^2$ $-y = (x + 1/2)^2 - 13/4$ $y = -(x + 1/2)^2 + 13/4$ <p>Vertex $(-1/2, 13/4)$</p>	<p>A company's daily profit, P, in hundreds of dollars, is given by $P(x) = -x^2 + 12x - 15$, where x is the number of items produced each day. How many items must be produced to maximize the profit? What is the maximum profit?</p> $y = -x^2 + 12x - 15$ $-(y + 15) = x^2 - 12x$ $-y - 15 + 36 = x^2 - 12x + 36$ $-y + 21 = (x - 6)^2$ $-y = (x - 6)^2 - 21$ $y = -(x - 6)^2 + 21$ <p>Vertex $(6, 21)$</p>	<p>The function $h = -16t^2 + rt$ gives the height h, in feet, that an object will reach in t seconds if it is projected straight upward with an initial velocity of r feet per second. If an arrow is shot vertically upward with an initial velocity of 128 feet, find the maximum height it will reach. When will it reach its maximum height?</p> $h = -16t^2 + 128t$ $\frac{h}{-16} = t^2 - 8t$ $\frac{h}{-16} + 16 = t^2 - 8t + 16$ $\frac{h}{-16} + 16 = (t - 4)^2$ $h / -16 = (t - 4)^2 - 16$ $h = -16(t - 4)^2 + 256$ <p>Vertex $(4, 256)$</p>
<p>HW: U9 L1 Homework. Practice this skill—Show all steps for HW credit.</p> $y = 3(x + 2)^2 - 13$ <p>Vertex $(-2, -13)$</p>	$y = -4(x + 2)^2 + 23$ <p>Vertex $(-2, 23)$</p>	$h = -16(t - 4)^2 + 256$ <p>Vertex $(-12, 135)$</p>