Quadratic Functions. Part II

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

Completing the square

$$(x+a)^2 = x^2 + 2ax + a^2$$

$$(x-a)^2 = x^2 - 2ax + a^2$$

Ex 1: $y = x^2 - 2x - 3$

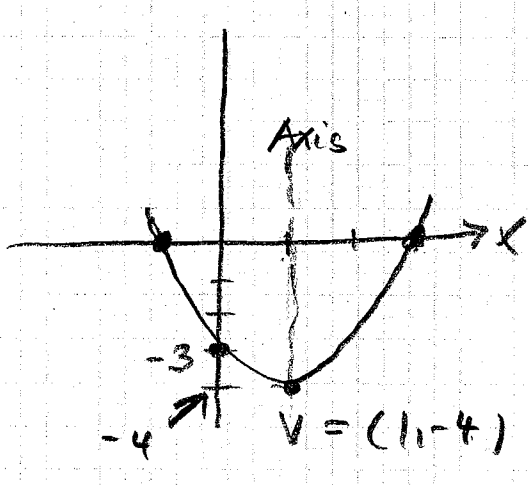
$a = 1 > 0$ ∪

$y = (x^2 - 2x + 1) - 3 - 1$

half of -2 is -1; -1 squared

$y = (x-1)^2 - 4$

$h = 1 \quad k = -4$



y-int

$x = 0 \Rightarrow y = x^2 - 2x - 3$

$y = -3$

x-int

$y = 0 \Rightarrow y = x^2 - 2x - 3$

$x^2 - 2x - 3 = 0$

• = −3 | −3, 1 |

+ = −2

$y = (x-3)(x+1) = 0$

$x - 3 = 0 \Rightarrow x = 3$

or

$x + 1 = 0 \Rightarrow x = -1$

Dom = $(-\infty, \infty)$

Range = $[-4, \infty)$

Axis: $x = 1$

Ex 2: $y = -x^2 + 2x + 3$

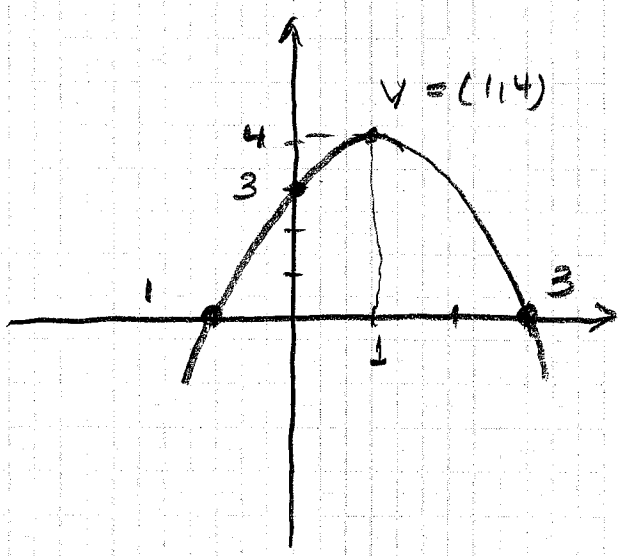
$a = -1 < 0$ ∩

$y = -(x^2 - 2x + 1) + 3 + 1$

-1

$y = -(x-1)^2 + 4$

$h = 1 \quad k = 4$



y-int

$x = 0 \Rightarrow y = -x^2 + 2x + 3$

$y = 3$

x-int

$y = 0 \Rightarrow y = -x^2 + 2x + 3 = 0$

$x^2 - 2x - 3 = 0$

0 = -3 | -3, 1 |

+ = -2

$(x-3)(x+1) = 0$

$x - 3 = 0 \Rightarrow x = 3$

or

$x + 1 = 0 \Rightarrow x = -1$

Ex3: $y = -3x^2 + 3x + 6$

$y = -3x^2 + 4x + 6$

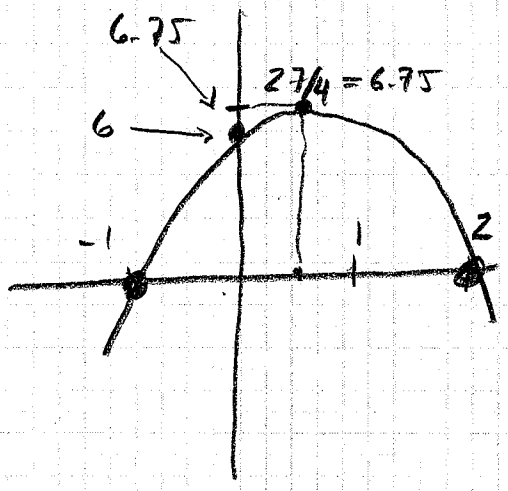
$-3\left(x^2 - \frac{4}{3}x \quad\right) + 6$

$y = -3(x^2 - x + \frac{1}{4}) + 6 + \frac{3}{4}$

$-\frac{1}{2}$

$y = -3(x - \frac{1}{2})^2 + \frac{27}{4}$

$h = \frac{1}{2} \quad k = \frac{27}{4} = 6.75$



y-int

$x = 0 \Rightarrow y = -3x^2 + 3x + 6$

$y = 6$

x-int

$y = 0 \Rightarrow y = -3x^2 + 3x + 6$

$-3x^2 + 3x + 6 = 0$

$x^2 - x - 2 = 0$

$\bullet = -2 \quad | \quad -2, 1$

$+ = -1$

$(x-2)(x+1) = 0$

$x - 2 = 0 \Rightarrow x = 2$

or

$x + 1 = 0 \Rightarrow x = -1$