7.6 Vertex Form of a Quadratic Function

Std. form: $y = ax^2 + bx + c$

factored form: $y = a(x - r)(x - s)$

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

vertex (h, k)

$y = 3(x - 4)^2 + 6$ vertex $(4, 6)$

$y = 2(x + 2)^2 + 2$ vertex $(-2, 2)$

$y = 2(x + 2)^2 - 4$ vertex $(-2, -4)$

p. 410

Sketch the graph of the following function:

$$f(x) = 2(x-3)^2 - 4$$

State the domain and range of the function.

$(x-3)(x-3)$

a +'ve

$\therefore$ opens up

vertex $(3,-4)$

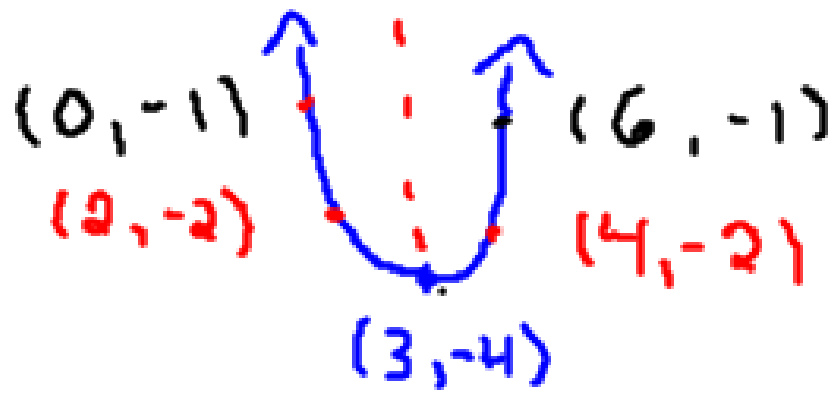
let $x = 2$

$y = 2(2-3)^2 - 4$

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

$y = 2 - 4$

$y = -2$



standard

Find the equation of a parabola with vertex (2,5) that passes through (-1, 23)

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

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

$y = a(x-2)^2 + 5$

$23 = a(-1-2)^2 + 5$

$23 = a(-3)^2 + 5$

$23 = 9a + 5$

$-5 \qquad -5$

$\frac{18}{9} = \frac{9a}{9}$

$a = 2$

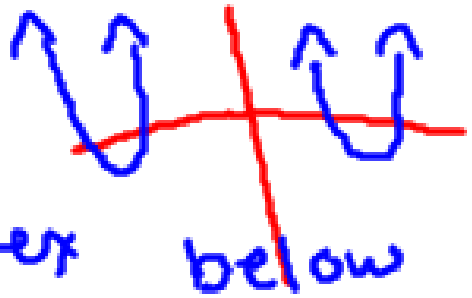
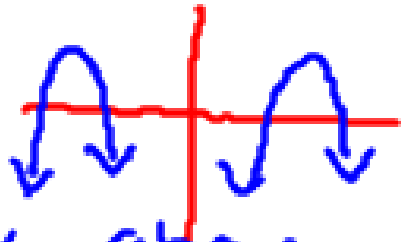
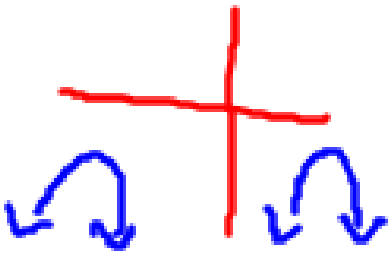
$y = 2(x-2)^2 + 5$

$y = 2(x^2 - 4x + 4) + 5$

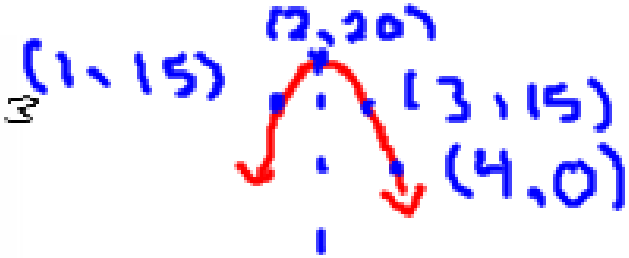
$y = 2x^2 - 8x + 8 + 5$

$y = 2x^2 - 8x + 13$

Number of solutions: (x-int)

	Concave up	Concave down
2:	 vertex below x-axis	 vertex above x-axis
1:	vertex is on the x-axis	
0:	 no solutions above x-axis	

A soccer ball is kicked from the ground. After 2 s, the ball reaches its maximum height of 20 m. It lands on the ground at 4 s. p.413



a) Determine the quadratic function that models the height of the kick.

b) Determine any restrictions that must be placed on the domain and range of the function.

c) What was the height of the ball at 1 s? When was the ball at the same height on the way down?

15m, again at 3 seconds.

Vertex (2, 20)

$y = a(x-2)^2 + 20$

$0 = a(4-2)^2 + 20$

$0 = a(2)^2 + 20$

$-20 = 4a$

$a = -5$

a) $y = -5(x-2)^2 + 20$

b) $0 \le x \le 4, x \in R$

$0 \le y \le 20, y \in R$

c) $y = ?$ $x = 1$

$y = -5(1-2)^2 + 20$

$y = -5(-1)^2 + 20$

$y = -5 + 20$

$y = 15\text{m}$

p. 417-419 - #1-5, 10-14