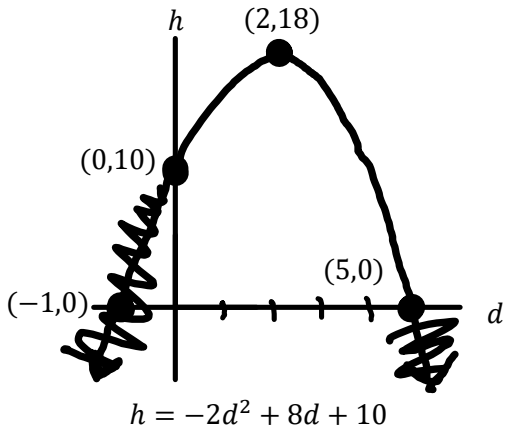
C11 - 3.10 - Max Height/Total Distance

Or 2nd Calc

The height vs distance of a bow and arrow shot off a cliff is represented by following equation:

$$h = -2d^2 + 8d + 10$$

What is the maximum height and the distance it took to get there? Draw on a graph.



Complete the Square

$$h = -2d^2 + 8d + 10$$
$$h = (-2d^2 + 8d) + 10$$
$$h = -2(d^2 - 4d) + 10$$
$$h = -2(d^2 - 4d + 4 - 4) + 10$$
$$h = -2(d^2 - 4d + 4) + 8 + 10$$
$$h = -2(d - 2)^2 + 18$$

V: (2,18)

(d, h)

$d = 2 \quad h = 18$

$\left(\frac{b}{2}\right)^2$

$\left(-\frac{4}{2}\right)^2$

$(-2)^2$

4

What was the height of the cliff?

$h - int$

$d = 0$

$h = -2d^2 + 8d + 10$

$h = -2(0)^2 + 8(0) + 10$

$h = 10$

How far did the arrow go before it hit the ground?

$h = 0$

$h = -2(d^2 - 4d - 5)$

$0 = -2(d - 5)(d + 1)$

Factor

$d + 1 = 0$

$d = -1$

Reject

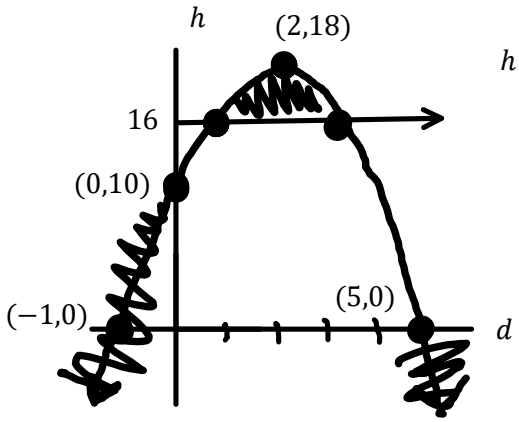
$d - 5 = 0$

$d = 5$

Find Domain and Range

D: [0,5] $or\ 0 \le x \le 5$ $\quad R$: [0,18] $or\ 0 \le y \le 18$

At what distance is the height 16 m (CH8)? At what distance is the height greater than 16m (CH9)?

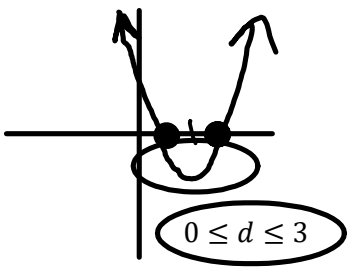


$h = 16 \quad h = -2d^2 + 8d + 10$

$$h = -2d^2 + 8d + 10$$
$$16 = -2d^2 + 8d + 10$$
$$-16 \qquad -16$$
$$0 = -2d^2 + 8d - 6$$
$$\frac{0}{-2} = \frac{-2d^2 + 8d - 6}{-2}$$
$$0 = d^2 - 4d + 3$$
$$0 = (d - 3)(d - 1)$$

$d = 3$ $\quad d = 1$

$$-2d^2 + 8d + 10 \ge 16$$
$$-16 \quad -16$$
$$-2d^2 + 8d - 6 \ge 0$$
$$\frac{-2d^2 + 8d - 6}{-2} \ge \frac{0}{-2}$$
$$d^2 - 4d + 3 \le 0$$
$$(d - 3)(d - 1) \le 0$$



$0 \le d \le 3$