Flight of a Ball *If a ball is thrown upward at 96 feet per second from the top of a building that is 100 feet high, the height of the ball can be modeled by* $S(t) = 100 + 96t - 16t^2$ *feet, where* t *is the number of seconds after the ball is thrown.*[1]

a. *Describe the graph of the model.*

The function $S(t)$ is quadratic which means the graph will be a parabola. Since the coefficient of the squared term is negative, the parabola will open down.

Let's look:

b. *Find the t-coordinate and S-coordinate of the vertex of the graph of this quadratic function.*

Algebraically, the vertex is at the point $\left(\frac{-b}{2a}, S\left(\frac{-b}{2a}\right)\right)$. Substituting $a = -16$ and $b = 96$ we get...

$$\begin{aligned}\frac{-b}{2a} &= \frac{-96}{2(-16)} \\ &= \frac{-96}{-32} \\ &= 3\end{aligned}$$

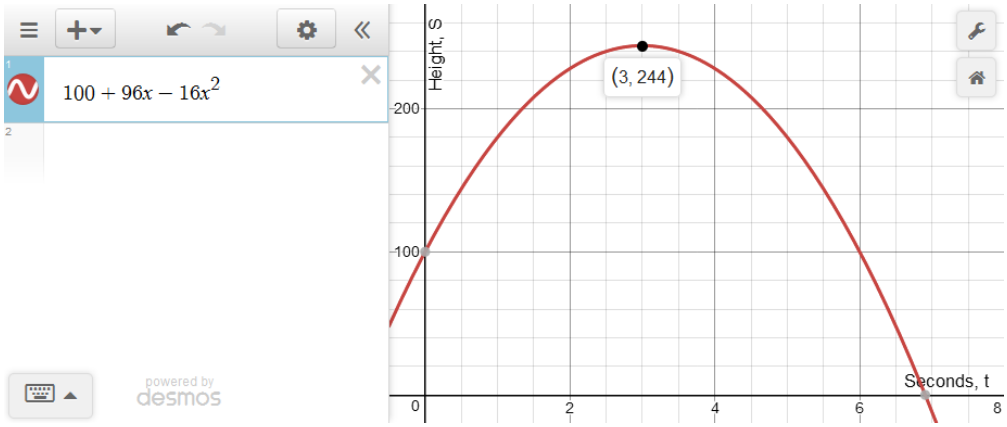
And...

$$\begin{aligned}S(3) &= 100 + 96(3) - 16(3)^2 \\ &= 100 + 288 - 144 \\ &= 244\end{aligned}$$

The vertex of the graph of this quadratic function is $t = 3$ and $S = 244$, or $(3, 244)$.

[1] Harshbarger/Yocco, *College Algebra In Context, 5e*, p. 178, #52.

We can also find the vertex on the graph.



c. *Explain the meaning of the coordinates of the vertex for this model.*

Remember, this graph does NOT show the path of the ball. Each point on the graph tells us the height of the ball some number of seconds after it is thrown.

The vertex, $(3, 244)$, tells us that it takes 3 seconds for the ball to reach its maximum height of 244 feet.