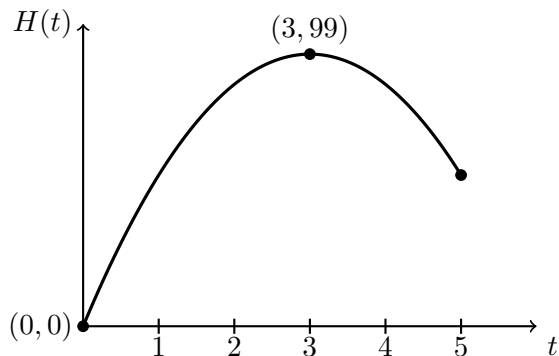


8. [10 points] Kiki has built an jetpack that she uses to fly to her lab each day. She begins at her house and arrives at her lab 5 minutes later, reaching a maximum vertical height of 99 meters above the level of her house 3 minutes into her flight. Suppose $H(t)$, her vertical height (in meters) above the level of her house t minutes after she leaves for the lab, is a quadratic function. Assume the domain of $H(t)$ is $0 \leq t \leq 5$.



- a. [3 points] On the axes above, carefully sketch graph of $H(t)$, labeling the vertical intercept and the vertex. You do not need to label the right endpoint of the graph.

- b. [4 points] Find a formula for $H(t)$ based on your graph.

$$H(t) = \underline{-11(t - 3)^2 + 99} .$$

Solution: Because we know the vertex of H is at $(3, 99)$, we can immediately write

$$H(t) = a(t - 3)^2 + 99.$$

The. we can use the point $(0, 0)$ to get $0 = 9a + 99$. This means $a = -11$.

- c. [3 points] Is Kiki's lab or house higher (vertically)? By how much? Give numerical evidence of your answer.

Solution: $H(5) = 55$ is the vertical height of the lab above Kiki's house, so the lab is higher by 55 feet.