

5. [11 points] A farmer is planning to plant a small apple orchard. She knows that the more trees she plants, the fewer apples each tree will produce due to the effects of crowding. In particular, if she plants x trees, when they are fully grown she expects each tree to produce a kilograms (kg) of apples each year, where

$$a = 20 - \frac{1}{5}x.$$

- a. [2 points] Describe the meaning of the slope of this line in the context of this problem.

Once the trees are fully grown, the total yearly harvest of the farmer's orchard, in kilograms, will be given by the quadratic function

$$h(x) = x\left(20 - \frac{1}{5}x\right).$$

- b. [5 points] Sketch a graph of $y = h(x)$ on the axes below. Be sure that the scale of each axis is clear, and that the vertex, vertical intercept, and any zeroes are clear. Also write the (x, y) coordinates of these points in the included blanks.



vertical intercept = _____

zeroes = _____

vertex = _____

- c. [2 points] What is a reasonable domain for $h(x)$ given the context of the problem? Briefly explain.
- d. [2 points] How many trees should the farmer plant to maximize her harvest? Briefly explain.