

3. [12 points] Antonia the ant is entering her first bug race. The track runs from the start line at the south end, represented by  $y = 0$ , to the finish line at the north end, represented by  $y = 4$ . All distances are given in feet.

Antonia's position  $t$  seconds after the race begins is given in parametric equations by:

$$x = \sin\left(\frac{\pi t}{2}\right), \quad y = 1.5^t - 1,$$

- a. [2 points] What is Antonia's position 2 seconds into the race?

$$x = \underline{\hspace{2cm}} \quad y = \underline{\hspace{2cm}}$$

- b. [3 points] At what time does Antonia reach the finish line?

$$\text{The time is } t = \underline{\hspace{2cm}}$$

- c. [3 points] What is the first time during the race that Antonia is travelling directly north?

$$\text{The time is } t = \underline{\hspace{2cm}}$$

- d. [4 points] Write an expression involving one or more integrals that gives the total distance, in feet, that Antonia traveled during the race. Do not evaluate your integral(s).

The distance is  $\underline{\hspace{4cm}}$