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:

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

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

$$x = \quad y =$$

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

The time is $t =$

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

The time is $t =$

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