8. [11 points] A basketball player is running sprints in Crisler Center. She begins in the middle of the "M" at the center of the court and runs north and south. Her velocity, in meters per second, for the first 9 seconds is $v(t) = t\sin\left(\frac{\pi}{3}t\right)$, where t is the number of seconds since she started running. She is running north when $v(t)$ is positive and south when $v(t)$ is negative.

a. [3 points] Show that the function

$$f(t) = \frac{9}{\pi^2}\sin\left(\frac{\pi}{3}t\right) - \frac{3}{\pi}t\cos\left(\frac{\pi}{3}t\right)$$

is an antiderivative of $v(t)$.

b. [3 points] Where on the court is the player after the 9 seconds? Show all your work and give your answer in exact form (no decimal approximations).

c. [5 points] What is the total distance traveled by the player in the 9 seconds? Show all your work and give your answer in exact form (no decimal approximations).