6. [11 points] Franklin, your robot, is zipping around the kitchen making his famous "Definitely Not Poison!" soup. His coordinates in the xy-plane are given by the parametric equations

$$x = t^2 - t \qquad y = -\sin(\pi t)$$

t seconds after he starts making soup. Assume that both x and y are measured in meters.

a. [2 points] Calculate $\frac{dx}{dt}$ and $\frac{dy}{dt}$.

$\frac{dx}{dt} =$ _____ $\frac{dy}{dt} =$ _____

b. [2 points] Find all times t when Franklin's velocity is zero.

$t =$_____

c. [3 points] Find Franklin's **speed** when $t = 2$ seconds. Include units.

Franklin's speed=_____

d. [4 points] Write an integral which gives the distance traveled by Franklin during his first five seconds of zipping around. Do not evaluate this integral.