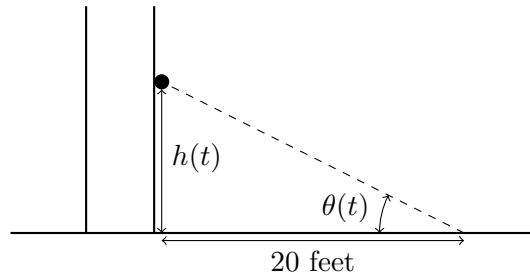


6. [12 points] Walking through Nichols Arboretum, you see a squirrel running down the trunk of a tree. The trunk of the tree is perfectly straight and makes a right angle with the ground. You stop 20 feet away from the tree and lie down on the ground to watch the squirrel. Suppose  $h(t)$  is the distance in feet between the squirrel and the ground, and  $\theta(t)$  is the angle in radians between the ground and your line of sight to the squirrel, with  $t$  being the amount of time in seconds since you stopped to watch the squirrel.



- a. [3 points] Write an equation relating  $h(t)$  and  $\theta(t)$ . (Hint: Use the tangent function.)
- b. [5 points] If  $\theta(t)$  is decreasing at  $1/5$  of a radian per second when  $\theta(t) = \pi/3$ , how fast is the squirrel moving at that time?
- c. [4 points] For the last second before the squirrel reaches the ground, it is moving at a constant speed of 20 feet per second. Suppose  $\theta'(t) = -3/4$  at some point during this last second. How high is the squirrel at this time?