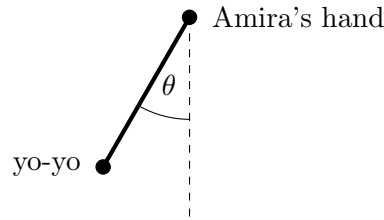


6. [10 points] Amira is using a yo-yo as a pendulum by holding the string and letting the yo-yo swing back and forth in a plane—that is, just left to right, not making any kind of ellipse when viewed from above. The symbol θ denotes the maximum angle the string makes with the vertical, as shown in the diagram to the right.



- a. [2 points] If θ is 15° and the length of the string between Amira's hand and the yo-yo is 3 ft, what is the length of the entire arc that the yo-yo swings through as it travels left to right? *Show all work. Give your answer in exact form or rounded to at least two decimal places.*

Answer: _____ ft

- b. [1 point] If Amira adjusted the yo-yo so that the length of the string between her hand and the yo-yo were only 1.5 feet instead, how would that change the length of the arc that the yo-yo swings through? *Show your work or explain.*

- c. [7 points] Now suppose that

- the length of the string between Amira's hand and the yo-yo is 2 feet,
- at its lowest point, the yo-yo is 1 foot above the ground,
- θ is $\pi/7$ radians,
- and that it takes 1.6 seconds for the yo-yo to make a full swing from left to right and back to left again.

Give all answers below in exact form or rounded to two decimal places.

Find the maximum height of the yo-yo. *Show all work, including a diagram.*

Answer: _____ ft

Let $h(t)$ be the function giving the height, in feet, of the yo-yo at time t seconds after it is released from its maximum height. Find the amplitude and period of $h(t)$.

Include units.

Answer: amplitude = _____

Answer: period = _____