

8. [12 points] Suppose Cato is riding a stationary exercise bicycle. His foot moves a pedal in a circle. Let $h(t)$ be the height (in cm) of the pedal above the ground at time t (in seconds). A formula for $h(t)$ is given by

$$h(t) = 20 \sin(2\pi t) + 30.$$

- a. [3 points] On the axes provided below, graph *two periods* of the function $P = h(t)$ starting with $t = 0$. (Clearly label the axes and important points on your graph. Be very careful with the **shape and key features** of your graph.)



- b. [2 points] Find the period and amplitude of $P = h(t)$. (*Include units.*)

Period: _____ **Amplitude:** _____

- c. [4 points] Find all the times t for $0 \leq t \leq 2$ when the pedal is exactly 45 cm above the ground. (*Find at least one answer algebraically. Show your work carefully and check that your answers make sense.*)

Answer(s): _____

- d. [3 points] Find the length of the arc through which the pedal travels between $t = 0$ and the time the pedal *first* reaches a height of exactly 45 cm. (*Show your work and reasoning. It may help to sketch a picture.*)

Answer(s): _____