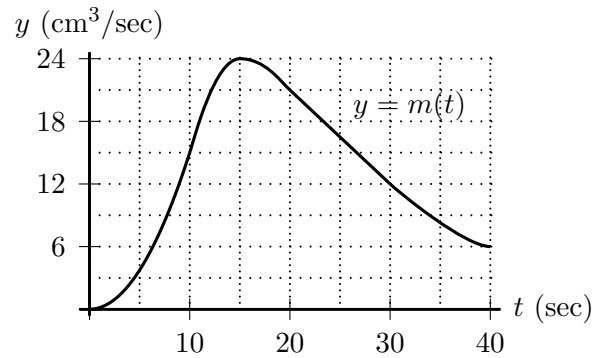


2. [10 points]

Kathy puts a very large marshmallow in the microwave for forty seconds and watches as it inflates. Let  $m(t)$  be the rate of change of the volume of the marshmallow, in  $\text{cm}^3/\text{sec}$ ,  $t$  seconds after Kathy puts it in the microwave. The graph of  $y = m(t)$  is shown to the right.



- a. [2 points] Write a definite integral equal to the total change in volume, in  $\text{cm}^3$ , of the marshmallow while in the microwave. (You do not need to evaluate the integral.)

**Answer:** \_\_\_\_\_

- b. [3 points] Estimate your integral from part (a) using a right-hand sum with  $\Delta t = 10$ . Be sure to write out all of the terms in the sum.

**Answer:** \_\_\_\_\_

- c. [5 points] Assume that throughout its time in the microwave, the marshmallow is a cylinder. After 30 seconds in the microwave, the marshmallow is a cylinder with radius 4.5 cm and height 11 cm. At that moment, the height is increasing at 0.08  $\text{cm}/\text{sec}$ . How fast is the radius of the marshmallow increasing at that moment?

*Recall that the volume  $V$  of a cylinder of radius  $r$  and height  $h$  is  $V = \pi r^2 h$ , and remember to include units.*

**Answer:** \_\_\_\_\_