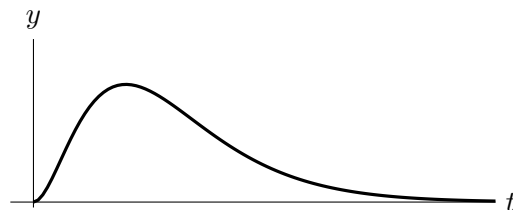


4. [7 points] Lin inflates a balloon using a helium pump. When she turns off the pump, the balloon immediately begins to deflate. Lin believes that she can model the balloon's volume, in cubic feet (ft^3), by the function

$$V(t) = \frac{at^2}{e^{bt}},$$

where t is the time, in seconds, after she begins inflating the balloon, and where a and b are positive constants. As an example, this function is shown to the right for one choice of the constants a and b . Note that the derivative of $V(t)$ is given by



$$V'(t) = -\frac{at(bt-2)}{e^{bt}}.$$

- a. [4 points] The function $V(t)$ appears to have a local maximum at some time $t > 0$. Find the time at which this local maximum occurs. Use calculus to find your answer, and be sure to give enough evidence that the point you find is indeed a local maximum. Your answer may be in terms of a and/or b .

Answer: local max at $t =$ _____

- b. [3 points] Lin knows that it took 8 seconds to inflate the balloon, and that its volume at that time was 1.5 ft^3 . Find the exact values of a and b for Lin's model. Show your work.

Answer: $a =$ _____ and $b =$ _____