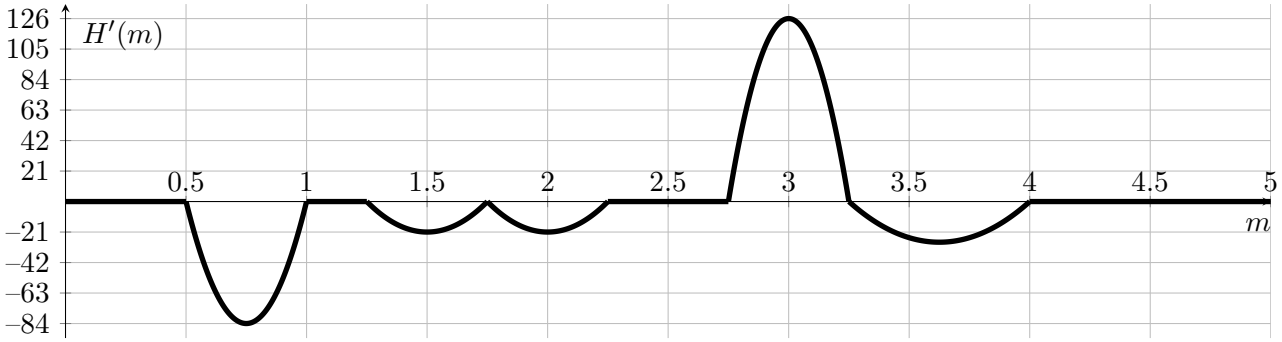
7. [8 points] You and your friends are analyzing the vertical motion of the elevator in Mason Hall, with $H(m)$ giving the height, in feet, of the elevator m minutes after 1:00 pm. Below is a graph of $H'(m)$, the **derivative** of $H(m)$.



a. [2 points] What is the speed of the elevator at 1:02 pm? *Include units.*

Answer: 21 **feet per minute** .

b. [1 point] Find all times m for $0 < m < 5$ when the elevator is moving with its maximum speed. Give your answers as values(s) and/or interval(s) of m.

Answer: $m = 3$.

c. [1 point] For which of the following intervals is the elevator moving *downward* over the entire interval? Circle all correct choices.

[(0.5, 0.75)] [(0.75, 1)] (2.75, 3) (3, 3.25) NONE OF THESE

d. [1 point] Is the elevator's position at 1:02 pm *above*, *below*, or at the *same level* as its initial position at 1:00 pm? Circle the one correct answer.

ABOVE [BELOW] SAME LEVEL

e. [1 point] Which of the following sentences best describes how the elevator is moving during the time interval $1.25 \le m \le 2$? Circle the one best choice.

[(i)] *The elevator gets stuck for a moment while going down.*

(ii) *The elevator is moving up and down.*

(iii) *The elevator leaves a floor but returns to the same floor.*

(iv) *The elevator is going down without issue.*

f. [2 points] Given that the elevator's position at 1:01 pm is 28 feet away from its position at 1:00 pm, find the average velocity of the elevator over the interval $0.5 \le m \le 1$. *Include units.*

Solution: From the graph of $H'(m)$, we see that the elevator is stationary from $m = 0$ to $m = 0.5$, and then moves down from $m = 0.5$ to $m = 1$. So if at 1:01pm it ends up 28 feet away from its position at 1pm, it must have moved 28 feet downward from $m = 0.5$ to $m = 1$, which means ints average velocity over this interval is $\frac{-28}{0.5} = -56$ ft/min.

Answer: -56 **feet per minute** .