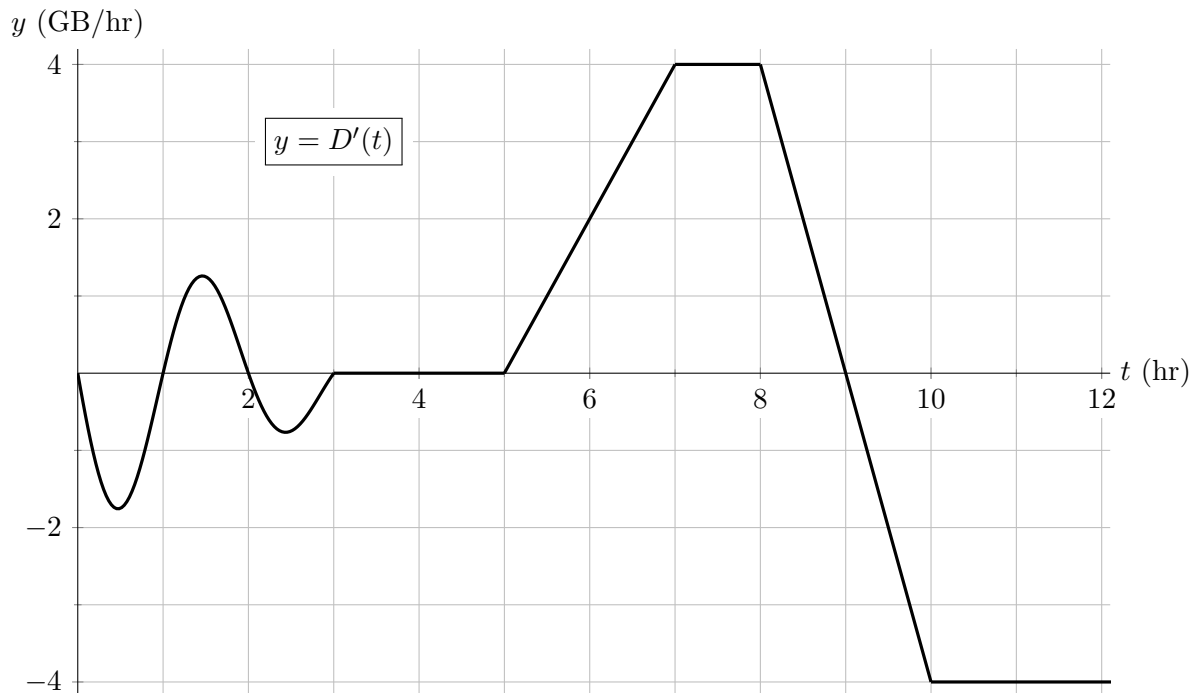**9.** [8 points] The server for a website stores user data. Let $D(t)$ be the amount of user data stored on the server, in gigabytes (GB), at time t hours after noon. Below is a portion of the graph of $D'(t)$, the **derivative** of $D(t)$. The function $D'(t)$ is

- constant for $3 \le t \le 5$, for $7 \le t \le 8$, and for $t \ge 10$, and is
- linear for $5 \le t \le 7$ and for $8 \le t \le 10$.

y (GB/hr)

$y = D'(t)$

t (hr)

a. [2 points] On which of the following intervals of t is the amount of user data stored on the server increasing for the entire interval? Give your answer as a list of one or more intervals, or write NONE.

$(0.5, 1.5)$ $\qquad\qquad$ $(1, 2)$ $\qquad\qquad$ $(7, 8)$ $\qquad\qquad$ $(10, 12)$

b. [2 points] When the amount of user data on the server is changing faster than 2 GB/hr, either increasing or decreasing, the server is said to be in an "excited state." How many hours, between noon and midnight, does the server spend in an excited state?

c. [2 points] The server hibernates when the amount of user data is not changing. How many hours, between noon and midnight, does the server spend in hibernation?

d. [2 points] At midnight, 450 GB of data is stored on the server. If the rate of change of user data stays the same from midnight to 5 am the following morning, how much user data will be stored on the server at 5 am?