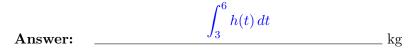
4. [11 points] Suppose the rate at which the amount of carbon dioxide (CO₂) in Walden Pond is changing t hours after 6am, in kilograms per hour, is given by the continuous function h(t). Some values of h(t) are given in the table below. Assume that between consecutive values of t given in the table, h(t) is either always increasing or always decreasing.

t	0	3	6	12	15	18	21
h(t)	-2	-5	0	6	8	7	0

No justification is required in any part of this problem, but partial credit may be awarded for work.

a. [2 points] Write an expression involving an integral that represents the change in the amount of CO₂ in Walden pond between 9am and 12 noon.



b. [2 points] Write an expression involving an integral that represents the average rate of change of CO_2 in Walden pond between 6am and 6pm.

Answer:
$$\frac{1}{12} \int_0^{12} h(t) dt$$
 kg/hr

- c. [7 points] Suppose H(t) is the amount of CO_2 in Walden Pond t hours after 6am, in kilograms, and assume H(0) = 600.
 - i. Put the following quantities in order from least to greatest.

$$H(0)$$
 $H(3)$ $H(18)$ $H(21)$ $H'(6)$ $h(0)$

Solution: Since $-5 \le h(t) \le -2$ for all $0 \le t \le 3$, we have $600 + 3(-5) \le H(3) < H(0)$. Since H'(6) = h(6) = 0, this means h(0) < H'(6) < H(3) < H(0). Also, we have H(18) < H(21) since $h(t) \ge 0$ for all $18 \le t \le 21$. Finally, since $h(t) \ge -5$ for all $0 \le t \le 6$, while $h(t) \ge 0$ for all $10 \le t \le 12$ and $10 \le t \le 12$ and $10 \le t \le 13$, we have

$$H(18) - H(0) = \int_0^{18} h(t) dt \ge 0.$$

Putting all this together gives us h(0) < H'(6) < H(3) < H(0) < H(18) < H(21).

Answer:
$$h(0) < H'(6) < H(3) < H(0) < H(18) < H(21)$$

LEAST GREATEST

ii. Write an expression which does not include a capital "H" that is equal to H(24). You may use the function h(t), along with any integrals, derivatives, or numbers that you want.

Answer:
$$H(24) =$$
