The tide removes sand from Sandy Point Beach at a rate modeled by the function R, given by

$$R(t) = 2 + 5\sin\left(\frac{4\pi t}{25}\right).$$

A pumping station adds sand to the beach at a rate modeled by the function S, given by

$$S(t) = \frac{15t}{1 + 3t}.$$

Both $R(t)$ and $S(t)$ have units of cubic yards per hour and t is measured in hours for $0 \le t \le 6$. At time $t = 0$, the beach contains 2500 cubic yards of sand.

in-out

(c) Find the rate at which the total amount of sand on the beach is changing at time $t = 4$.

↳ derivative (given)

$\boxed{S(4) - R(4) = -1.908}$ yd^3/hr

(d) For $0 \le t \le 6$, at what time t is the amount of sand on the beach a minimum? What is the minimum value? Justify your answers.

derivative = 0

rate of change = 0

rate in - rate out = 0

$S(t) - R(t) = 0$

$S(t) = R(t)$

$t = 5.1178$

$A = 2500 - \int_0^{5.1178} R(t)\,dt + \int_0^{5.1178} S(t)\,dt$

time	Amount
0	2500
5.1178	
6	