1. A plant produces starch depending on the intensity of heat it receives during the day. Assume the rate of starch production of the plant is
\[
\frac{dS}{dt} = \frac{4t}{1 + t^2} \text{ grams per hour}
\]
where time \( t \) is measured in hours and \( S(t) \) is the amount of starch produced \( t \) hours after noon each day (time \( t = 0 \) is noon, \( t = 1 \) is 1pm and so on).

a. Estimate the total change in \( S(t) \) between 1pm and 3pm using the right-hand Riemann sum with \( \Delta t = 0.5 \). Draw your rectangles or step functions on the figure below:

b. Find the exact area under the curve \( \frac{4t}{1 + t^2} \) between times \( t = 1 \) and \( t = 3 \).
2. Let $L(t) = \text{the length (in cm) of a fish at time } t \text{ (in years).}$ Suppose that the fish grows at a rate $\frac{dL}{dt} = 5.0e^{-0.2t}$. Use the definite integral to determine the total change in length of the fish between times $t = 5$ and $t = 10$. 
