8.3 Applying Accumulation and Integrals

CA #2

Calculus Name: ______________________________

1. The rate of temperature change of the water in a lake is given by $L(t)$, where L is measured in in degrees Celsius (°C) per day and t is measured in days since the start of summer. Using correct units, explain the meaning of $\int_0^{30} L(t)\,dt$.

2. **Calculator active.** Javier is excited to see his first snowstorm (especially since school will be canceled). Snow accumulates on his driveway starting at midnight. The snow accumulates on the driveway at a rate modeled by $s(t) = 2te^{\sin t}$ cubic feet per hour where t is measured in hours since midnight.
   a. Interpret the meaning of $\int_3^6 s(t)\,dt$ in the context of this problem.

   b. Find $\int_3^6 s(t)\,dt$.

3. When a grocery store opens, it has 80 pounds of apples on a table for customers to purchase. Customers remove apples from the table at a rate modeled by $f(t) = 8 + (0.7t)\cos\left(\frac{t^3}{50}\right)$ for $0 < t \leq 10$ where $f(t)$ is measured in pounds per hour and t is the number of hours after the store opened. Write, but do not solve, an equation involving an integral to find the time x when the amount of apples on the table is 60 pounds.

4.

t (seconds)	0	1	2	3	4	5
$W(t)$ (ounces)	0	4.2	8.3	10.7	13.5	14.1

On a cold winter morning, hot water is pouring into a cup for hot chocolate. The amount of water in the cup at time t, $0 \leq t \leq 5$, is given by a differentiable function W, where t is measured in seconds. Selected values of $W(t)$, measured in ounces, are given in the table above.

a. Use the data in the table to evaluate $\int_3^5 W'(t)\,dt$.

b. Using correct units, interpret the meaning of $\int_3^5 W'(t)\,dt$ in the context of this problem.

5.

t (minutes)	0	10	20	30
$W'(t)$ (°F/min)	0.8	1.7	0.9	0.5

The table above shows the rate at which Mr. Brust's hot tub is changing temperature over a 30-minute period. Before turning on the hot tub, the temperature of the water is measured to be 52 °F.

a. Using correct units, interpret the meaning of $\int_{10}^{30} W'(t)\,dt$ in the context of this problem.

b. Use a right Riemann sum, with the three subintervals indicated by the data in the table, to approximate $\int_{0}^{30} W'(t)\,dt$. Use appropriate units.

c. Using your answer from part (b), what is the temperature of the water after 30 minutes.

Answers to 8.3 CA #2

1a. Measures the change in temperature of the water in °C 30 days after the start of summer.	2a. The amount of snow that accumulates on the driveway between 3:00 a.m. and 6:00 a.m. 2b. 14.3556 cubic feet	3. $80 - \int_0^x f(t)\,dt = 60$

4a. 3.4 ounces 4b. Between the 3rd and 5th second, there are 3.4 ounces of water poured into the cup.	5a. How much the temperature has changed between the 10th and 30th minute. 5b. 31 °F 5c. 83 °F