2013 AP® CALCULUS AB FREE-RESPONSE QUESTIONS

CALCULUS AB SECTION II, Part B Time—60 minutes

Number of problems—4

No calculator is allowed for these problems.

t (minutes)	0	1	2	3	4	5	6
C(t) (ounces)	0	5.3	8.8	11.2	12.8	13.8	14.5

- 3. Hot water is dripping through a coffeemaker, filling a large cup with coffee. The amount of coffee in the cup at time t, $0 \le t \le 6$, is given by a differentiable function C, where t is measured in minutes. Selected values of C(t), measured in ounces, are given in the table above.
 - (a) Use the data in the table to approximate C'(3.5). Show the computations that lead to your answer, and indicate units of measure.
 - (b) Is there a time t, $2 \le t \le 4$, at which C'(t) = 2? Justify your answer.
 - (c) Use a midpoint sum with three subintervals of equal length indicated by the data in the table to approximate the value of $\frac{1}{6} \int_0^6 C(t) dt$. Using correct units, explain the meaning of $\frac{1}{6} \int_0^6 C(t) dt$ in the context of the problem.
 - (d) The amount of coffee in the cup, in ounces, is modeled by $B(t) = 16 16e^{-0.4t}$. Using this model, find the rate at which the amount of coffee in the cup is changing when t = 5.