AP Calculus BC 2 Assignment 234 Wednesday, April 15, 2015 Hour Name

Page 1 Non-Calculator

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

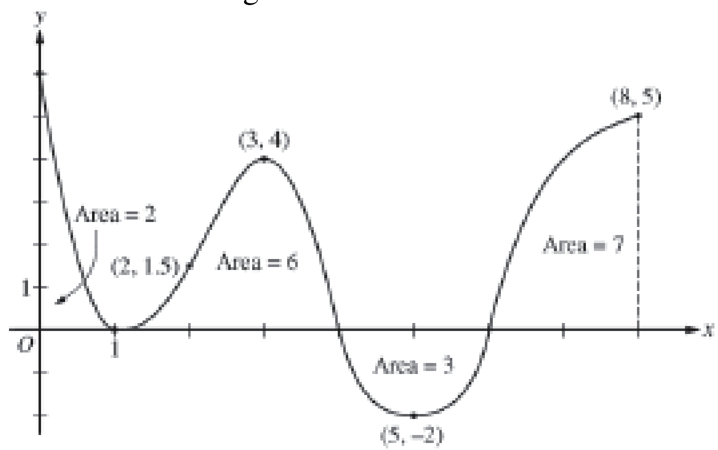
Hot water is dripping through a coffeemaker, filling a large cup with coffee. The amount of coffee in the cup at time t, $0 \le t \le 6$, is given by a differentiable function C, where t is measured in minutes. Selected values of C(t), measured in ounces, are given in the table above.

a. Use the data in the table to approximate C'(3.5). Show the computations that lead to your answer, and indicate units of measures.

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



Graph of f '

The figure above the graph of f ', the derivative of a twice differentiable function f, on the closed interval $0 \leq x \leq 8$. The graph of f ' has horizontal tangent lines at x = 1, x = 3, and x = 5. The areas of the regions between the graph of f ' and the x-axis are labeled in the figure. The function f is defined for all real numbers and satisfies f(8) = 4.

a.	Find all values of x on the open interval $0 < x < 8$ for which the function f has a local minimum. Justify your answer.
b.	Determine the absolute minimum value of f on the closed interval $0 \leq x \leq 8$. Justify your answer.
c.	On what open intervals contained in $0 < x < 8$ is the graph of f both concave down and increasing? Explain your reasoning
d.	The function g is defined by $g(x) = (f(x))^3$. If $f(3) = -\frac{5}{2}$, find the slope of the line tangent to the graph of g at x = 3.

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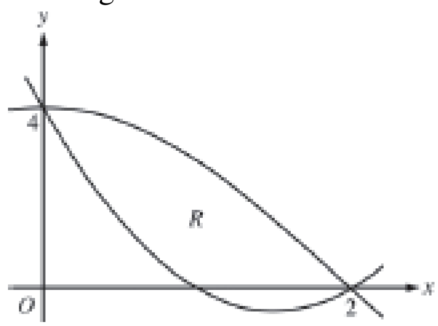

Let $f(x) = 2x^2 - 6x + 4$ and $g(x) = 4\cos\frac{\pi x}{4}$. Let R be the region bounded by the graphs of f and g, as shown in the figure above.

a. Find the area of R.

b. Write, but do not evaluate, an integral expression that gives the volume of the solid generated when R is rotated about the horizontal line $y = 4$.

c. The region R is the base of a solid. For this solid, each cross section perpendicular to the x-axis is a square. Write, but do not evaluate, an integral expression that gives the volume of the solid.

Consider the differential equation $\frac{dy}{dx} = y^2(2x + 2)$. Let y = f(x) be the particular solution to the differential equation with initial condition f(0) = -1.

a. Find $\lim_{x \to 0} \frac{f(x) + 1}{\sin x}$. Show the work that leads to your answer.

b. Use Euler's method, starting at x = 0 with two steps of equal size, to approximate $f\left(\frac{1}{2}\right)$.

c. Find y = f(x), the particular solution to the differential equation with initial condition f(0) = -1.