AP Calculus
Technology Tuesday #3

Name: _____
Date: _____ Per: ____

Type calculator steps to recall later:

1)

A 12,000-liter tank of water is filled to capacity. At time $t = 0$, water begins to drain out of the tank at a rate modeled by $r(t)$, measured in liters per hour, where r is given by the piecewise-defined function

$$r(t) = \begin{cases} \dfrac{600t}{t+3} & \text{for } 0 \le t \le 5 \\ 1000e^{-0.2t} & \text{for } t > 5 \end{cases}$$

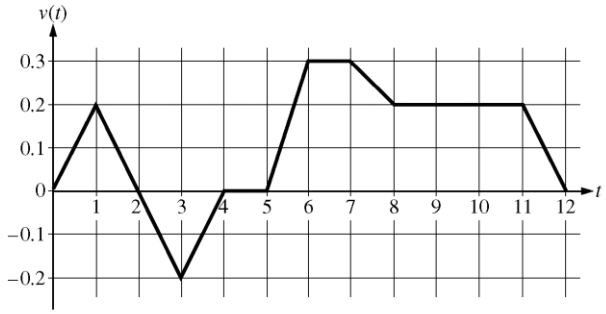
(a) Is r continuous at $t = 5$? Show the work that leads to your answer.

(b) Find the average rate at which water is draining from the tank between time $t = 0$ and time $t = 8$ hours.

(c) Find $r'(3)$. Using correct units, explain the meaning of that value in the context of this problem.

(d) Write, but do not solve, an equation involving an integral to find the time A when the amount of water in the tank is 9000 liters.

2)



Caren rides her bicycle along a straight road from home to school, starting at home at time $t = 0$ minutes and arriving at school at time $t = 12$ minutes. During the time interval $0 \le t \le 12$ minutes, her velocity $v(t)$, in miles per minute, is modeled by the piecewise-linear function whose graph is shown above.

(a) Find the acceleration of Caren's bicycle at time $t = 7.5$ minutes. Indicate units of measure.

(b) Using correct units, explain the meaning of $\int_0^{12} |v(t)|\,dt$ in terms of Caren's trip. Find the value of $\int_0^{12} |v(t)|\,dt$.

(c) Shortly after leaving home, Caren realizes she left her calculus homework at home, and she returns to get it. At what time does she turn around to go back home? Give a reason for your answer.

(d) Larry also rides his bicycle along a straight road from home to school in 12 minutes. His velocity is modeled by the function w given by $w(t) = \dfrac{\pi}{15}\sin\left(\dfrac{\pi}{12}t\right)$, where $w(t)$ is in miles per minute for $0 \le t \le 12$ minutes. Who lives closer to school: Caren or Larry? Show the work that leads to your answer.

3) Find the absolute maximum of $y = \frac{5}{3}x^3 - x^2 - 7x$ on the interval $[-2,2]$.

(A) $\frac{10}{3}$
(B) $\frac{14}{3}$
(C) 0
(D) $\frac{13}{3}$
(E) $-\frac{539}{75}$

4) Suppose $F(x) = \int_0^x t^3 + t\ dt$. What is the change in $F(x)$ as t increases from 1 to 4?

(A) 72
(B) 71.25
(C) 24.75
(D) 6
(E) 0.75

5) Find the average value of $f(x) = (3x - 1)^3$ on the interval $-1 \leq x \leq 3$.

(A) 80
(B) 85
(C) 160
(D) 170
(E) 320