Unit 4 - End of Unit Review - FRQ Review

Calc. AB/BC

For time $0 \le t \le 10$, water is flowing into a small tub at a rate given by the function F defined by $F(t) = \arctan\left(\frac{\pi}{2} - \frac{t}{10}\right)$. For time $5 \le t \le 10$, water is leaking from the tub at a rate given by the function L defined by $L(t) = 0.03(20t - t^2 - 75)$. Both $F(t)$ and $L(t)$ are measured in cubic feet per minute, and t is measured in minutes. The volume of water in the tub, in cubic feet, at time t minutes is given by $W(t)$.

(a) At time $t = 3$, there are 2.5 cubic feet of water in the tub. Write an equation for the locally linear approximation of W at $t = 3$, and use it to approximate the volume of water in the tub at time $t = 3.5$.

(b) Find $W''(8)$. Using correct units, interpret the meaning of $W''(8)$ in the context of the problem.

(c) Is there a time t, for $5 < t < 10$, at which the rate of change of the volume of water in the tub changes from positive to negative? Give a reason for your answer.

(d) The tub is in the shape of a rectangular box that is 0.5 foot wide, 4 feet long, and 3 feet deep. What is the rate of change of the depth of the water in the tub at time $t = 6$?

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Notes Filled In:

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