

Unit 7 - End of Unit FRQ Review

Calc. BC

Warmup: Questions from Lesson 7.9?

If you haven't finished the CA worksheet from yesterday take it out and continue to work on it during this time.

Liquid fertilizer is injected into a hydroponics growing system via a pumping system. The total amount of liquid fertilizer injected into the growing system by time t is modeled by the function F that satisfies the logistic differential equation $\frac{dF}{dt} = \frac{1}{3}F(6 - F)$, where t is measured in months and F is measured in liters. At time $t = 0$, 3 liters of liquid fertilizer are injected into the growing system. (Note: Hydroponics is the process of growing plants in sand, gravel, or liquid, with added nutrients but without soil.)

(a)

(i) Find $\lim_{t \rightarrow \infty} F(t)$.

(ii) Find $\lim_{t \rightarrow \infty} \frac{dF}{dt}$.

(b) Find the value of $\frac{dF}{dt}$ at the time when F is increasing most rapidly. Give a reason for your answer, and indicate units of measure.

(c) Find $\frac{d^2 F}{dt^2}$ in terms of F .

(d)

(i) Use Euler's method, starting at $t = 0$ with two steps of equal size, to approximate the total amount of liquid fertilizer injected into the growing system by time $t = 1$ month. Show the computations that lead to your answer.

(ii) Is the approximation an overestimate or an underestimate for the total amount of liquid fertilizer injected into the growing system by time $t = 1$ month? Give a reason for your answer.

Notes Filled In:

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