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Bonus Take-Home Quiz Due Wednesday, October 7, 2015

2015-2016 Fall Semester MATH 1350 (Barsamian)

Score = $\frac{\quad}{12} = \quad\%$

Part 1: Rate of Change Problem (Exponential Function)

A drug is administered by injection. The drug concentration (in milligrams per liter) in the bloodstream t hours after the injection is given by the formula $c(t) = 3e^{\left(-\frac{t}{2}\right)}$ for $0 \leq t$

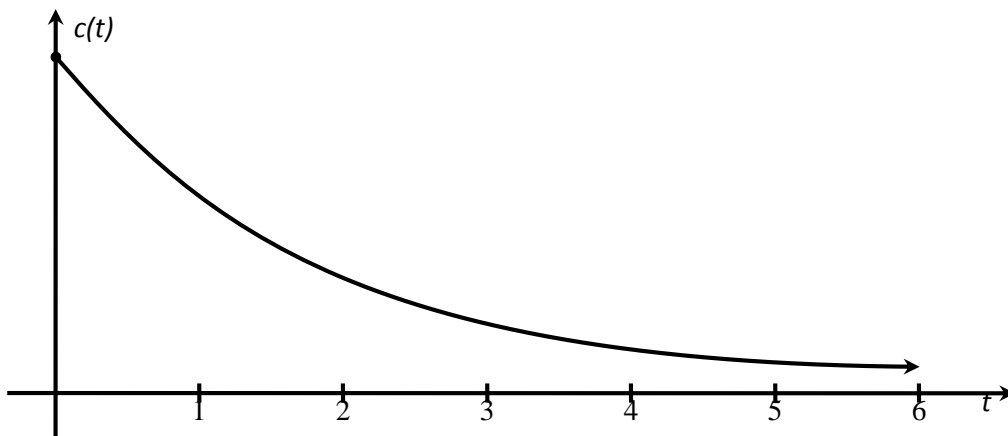
(A) Find the concentration after 1 hours and after 4 hours. (Give an exact answer in symbols and then approximate answer in decimals. Include units in your answer.)

(B) Find the rate of change of the concentration after 1 hours. (Give an exact answer in symbols and then approximate answer in decimals. Include units in your answer.)

(C) Find the rate of change of the concentration after 4 hours. (Give an exact answer in symbols and then approximate answer in decimals. Include units in your answer.)

(D) Find the average rate of change of the concentration from 1 to 4 hours. (Give an exact answer in symbols and then approximate answer in decimals. Include units in your answer.)

(E) A graph of the concentration is shown below. Illustrate each of the quantities found in questions (A) – (D) on the graph.



Part 2: Rate of Change Problem (Rational Function with Peak)

A drug is administered by pill. The drug concentration (in milligrams per milliliter) in the bloodstream t hours after the pill is taken is given by the formula

$$C(t) = \frac{0.14t}{t^2 + 1} \text{ for } 0 \leq t$$

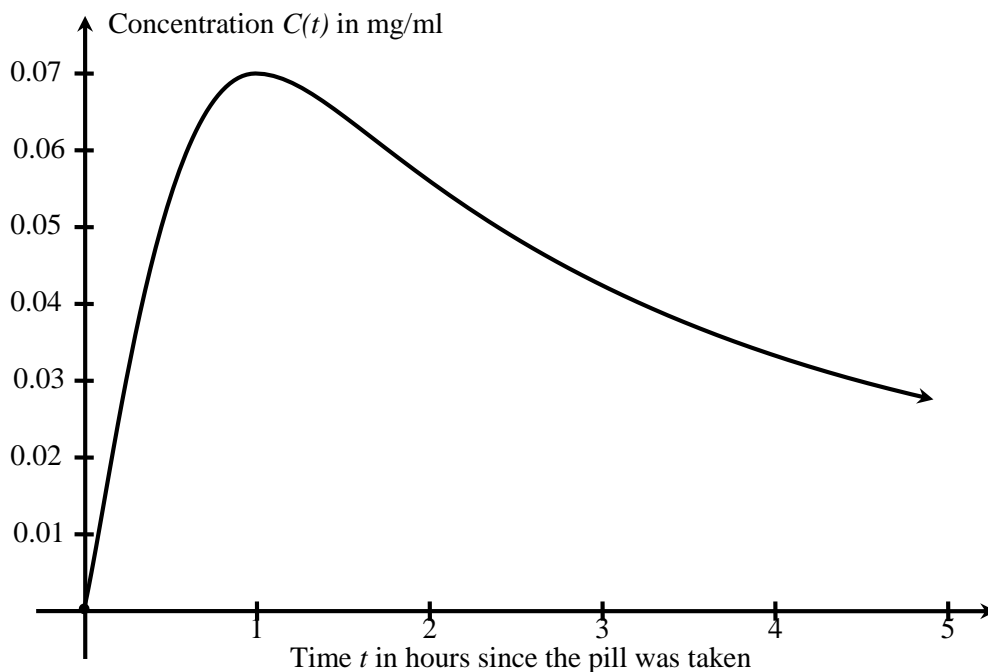
(A) Find $C(0.5)$ and $C(3)$. (Give exact answers in symbols and then approximate answers in decimals. Include units in your answer.)

(B) Find $C'(t)$.

(C) Find $C'(0.5)$ and $C'(3)$. (Give exact answers in symbols and then approximate answers in decimals. Include units in your answer.)

(D) Interpret the results of (A) & (C). (Refer to textbook example 6 on page 230 with similar question.)

(E) A graph of the concentration is shown below. Illustrate each of the quantities found in questions (A) & (C).



Part 3: Rate of Change Problem (Rational Function with Horizontal Asymptote)

Bob wrote an iPhone Calculus app. The sales of the app are modeled by the function

$$S(t) = \frac{240t^2}{t^2 + 36}$$

In this function, t is a variable representing time in months since the app was introduced.

$S(t)$ is the total number of apps (in thousands) that have been sold at time t .

(A) Find $S(6)$. (exact answer)

(B) Find $S'(6)$. (exact answer)

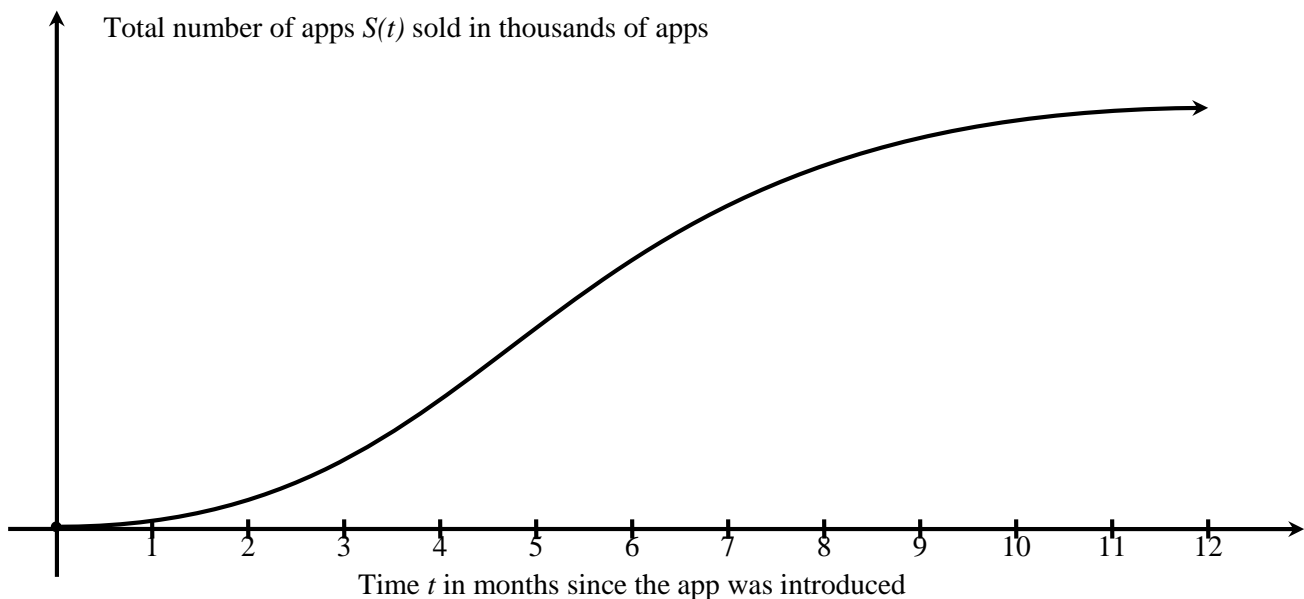
(C) Interpret the results of (A) & (B). (Refer to textbook example 6 on page 230 with similar question.)

(D) Use the results of (A) and (B) to estimate the total sales after 7 months. (exact answer)

(E) Find the actual value of the total sales after 7 months. (exact answer then approximate answer)

(F) How many apps can Bob hope to eventually sell? (exact answer)

(G) Illustrate the answers to (A), (B), (D), (E), (F) using the graph below



Part 4: Rate of Change Problem (Square Root Function)

A company manufactures cameras. The weekly cost function is $C(x) = 6 + \sqrt{4x + 4}$. In this equation, x is the number of hundreds of cameras produced per week, and $C(x)$ is the cost per week, in thousands of dollars.

(A) What is the fixed cost? (exact answer, with units)

(B) What is the cost to produce 3 hundred cameras per week? (exact answer, with units)

(C) What is the marginal cost at a production level of 3 hundred cameras per week? (exact answer, with units)

(D) Use your answers to (B) and (C) to estimate the cost to produce 4 hundred cameras per week. (exact answer, with units)

(E) What is the actual cost of producing 4 hundred cameras per week? (exact answer and a decimal approximation, with units)

(F) A graph of the cost function is shown at below. Illustrate each of the quantities found in questions (A) - (E).

