4.1 / Practice workbook

The Meaning of the Derivative in Context

Practice

Problems 1–5 / Show your reasoning

1 The temperature of a cup of tea is $H(t)$ degrees Fahrenheit, t minutes after it is poured. Which of the following is the best interpretation of $H'(4) = -2.5$?

A. At $t = 4$ minutes, the temperature of the tea is -2.5 degrees.

B. At $t = 4$ minutes, the temperature of the tea is decreasing at a rate of 2.5 degrees per minute.

C. During the first 4 minutes, the temperature of the tea drops 2.5 degrees.

D. The temperature of the tea drops 2.5 degrees every 4 minutes.

4.1 / AP-style free response

Problem 2 ➤ / *Show the work and the reasons a grader looks for.*

The amount of water in a storage tank is $W(t) = 200 - 30\ln(t+1)$ gallons, t hours after a valve is opened, $0 \le t \le 10$.

(a) Find $W'(2)$. Give units.

(b) Interpret $W'(2)$ in the context of the problem.

4.1 / AP-style free response

Problem 3 ➤ */ Show the work and the reasons a grader looks for.*

A theater sells tickets for p dollars each. Its revenue is $R(p) = 600p - 20p^2$ dollars.

(a) Find $R'(12)$.

(b) What are the units of $R'(12)$? Interpret $R'(12)$ in context.

4 The height of a plant is $h(t)$ centimeters, t days after it is planted. Which of the following is true if $h'(10) = 0.8$ and $h''(10) = -0.05$?

A. On day 10, the plant is 0.8 cm tall.

B. On day 10, the plant is getting shorter.

C. On day 10, the plant is growing at 0.8 cm per day, and its growth rate is decreasing.

D. On day 11, the plant will be exactly 0.75 cm taller than on day 10.

4.1 / AP-style free response

Problem 5 ➤ */ Show the work and the reasons a grader looks for.*

The number of fish in a pond is modeled by $P(t) = \dfrac{400}{1 + 3e^{-\frac{t}{2}}}$, t years after the pond is stocked.

(a) Find $P'(0)$. Show the work that leads to your answer.

(b) Interpret $P'(0)$ in context, with units.

4.1 / Answer key

The Meaning of the Derivative in Context

1 (B)

2 (a) $W'(2) = -10$ gallons per hour; (b) At $t = 2$ hours, the amount of water in the tank is decreasing at a rate of 10 gallons per hour

3 (a) 120; (b) dollars per dollar; at a price of 12 dollars, revenue is increasing at 120 dollars per dollar of ticket price

4 (C)

5 (a) $\frac{75}{2}$; (b) At $t = 0$, the number of fish is increasing at a rate of 37.5 fish per year