Math 122B · Section 15 · Fall 2015   Instructor: Dr. Gilbert

Answer the following problems to the best of your ability. If a problem asks for an interpretation or a written explanation, write in complete sentences.

1. The cost, C (in dollars), to produce g gallons of a chemical can be expressed as $C = f(g)$. Using units, explain the meaning of the following statements in terms of the chemical:

   (a) $f(200) = 1300$

   (b) $f'(200) = 6$

2. The time for a chemical reaction, T (in minutes), is a function of the amount of catalyst present, a (in milliliters), so $T = f(a)$.

   (a) If $f(5) = 18$, what are the units of 5? What are the units of 18? What does this statement tell us about the reaction?

   (b) If $f'(5) = -3$, what are the units of 5? What are the units of -3? What does this statement tell us?

3. An economist is interested in how the price of a certain item affects its sales. At a price of $\$p$, a quantity, q, of the item is sold. If $q = f(p)$, explain the meaning of each of the following statements:

(a) $f(150) = 2000$

(b) $f'(150) = -25$

4. Suppose $C(r)$ is the total cost of paying off a car loan borrowed at an annual interest rate of $r\%$. What are the units of $C'(r)$? What is the practical meaning of $C'(r)$? What is its sign?

5. Let $p(h)$ be the pressure in dynes per cm^2 on a diver at a depth of h meters below the surface of the ocean. What do each of the following quantities mean to the diver? Give units for the quantities.

    (a) $p(100)$

    (b) h such that $p(h) = 1.2 \cdot 10^6$

    (c) $p(h) + 20$

    (d) $p(h + 20)$

    (e) $p'(100)$

    (f) h such that $p'(h) = 100,000$

6. (a) If you jump out of an airplane without a parachute, you fall faster and faster until air resistance causes you to approach a steady velocity, called the *terminal* velocity. Sketch a graph of your velocity against time.

   (b) Explain the concavity of your graph.

   (c) Assuming air resistance to be negligible at $t = 0$, what natural phenomenon is represented by the slope of the graph at $t = 0$?