Keeper 3.3 – Interpreting the Derivative

Virtual Problems

Script: The instantaneous rate of change in "y" (in context) when "x" (in context with value) is "derivative" (in context with units) ****Make it sound good!!**

1. If $q = f(p)$ gives the number of pounds of sugar produced when the price per pound is p dollars, then what are the units and the meaning of the statement $f'(3) = 50$?

2. The cost, C (in dollars) to product g gallons of ice cream can be expressed as $C = f(g)$. Using units, explain the meaning of the following statements in terms of ice cream.
   (a) $f(200) = 350$

   (b) $f'(200) = 1.4$

3. 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 unit 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?

4. For some painkillers, the size of the dose, D, given depends on the weight of the patient, W. Thus, $D = f(W)$, where D is in milligrams and W is in pounds.
   (a) Interpret the statements $f(140) = 120$ and $f'(140) = 3$ in terms of this painkiller.

   (b) Use the information in the statements in part (a) to estimate $f(145)$.

5. Let $f(t)$ be the number of centimeters of rainfall that has fallen since midnight, where t is the time in hours. Interpret the following in practical terms, giving units.
   (a) $f(10) = 3.1$

   (b) $f^{-1}(10) = 16$

   (c) $f'(8) = 0.4$

   (d) $(f^{-1})'(5) = 2$

6. Oil is leaking from a tank. The amount of oil, in gallons, in the tank is given by $G(t) = 4000 - 3t^2$, where $0 \le t \le 24$ is the number of hours past midnight.
   a. Find $G'(5)$ using the definition of the derivative

   b. Using appropriate units, interpret the meaning of $G'(5)$ in the context of the problem

7. The surface area S (in square meters) of a balloon is expanding as a function of time t (in seconds) according to $S = S(t) = 5t^2$. Find the rate of change of the surface area of the balloon with respect to time. What are the units of $S'(t)$?