Interpreting Derivatives

1. The function L gives the average length of salmon in a particular pond as a function of age (time) in years, t . Write the meaning for each of the following expressions in the context of this situation.

   (a) $g(5) - g(2)$

   (b) $\dfrac{g(t+4) - g(t)}{4}$

   (c) $\lim\limits_{\Delta t \to 0} \dfrac{g(3.7 + \Delta t) - g(3.7)}{\Delta t}$

2. The temperature T (in degrees Fahrenheit) of a 12 ounce cup of coffee at time t (in minutes since the coffee was brewed) is given by $T(t) = \dfrac{3}{8}t^2 - 13t + 180$ for $0 \leq t \leq 10$. What is the most appropriate interpretation of the statement

$$T'(4.2) = -9.85?$$

   a. 4.2 minutes after the coffee was brewed, the temperature of the coffee was 9.85 degrees Fahrenheit less than the initial brew temperature.

   b. 4.2 minutes after the coffee was brewed, the temperature of the coffee was changing at a rate of -9.85 degrees Fahrenheit per minute.

   c. On average, the temperature of the coffee decreased by 9.85 degrees Fahrenheit each minute over the first 4.2 minutes since it was brewed.

   d. The temperature of the coffee decreased by 9.85 degrees Fahrenheit during the fourth minute after the coffee was brewed.

   e. The temperature of the coffee was approximately 132.01 degrees Fahrenheit exactly 4.2 minutes after the coffee was brewed.

3. The function f gives the amount of water (in thousands of gallons) in a Stillwater water tower t hours after noon on September 17, 2019. Write the meaning for each of the following expressions in the context of this situation.

   a. $f(1)$

   b. The solution t_0 to the equation $f(t_0) = 5.2$

   c. $f(7.2) - f(3.5)$

   d. $\dfrac{f(t+6) - f(t)}{6}$

   e. $\lim\limits_{\Delta t \to 0} \dfrac{f(5.2 + \Delta t) - f(5.2)}{\Delta t}$

   f. The solution t_0 to the equation $\lim\limits_{\Delta t \to 0} \dfrac{f(t_0 + \Delta t) - f(t_0)}{\Delta t} = -125$

4. The function $y = g(t)$ measures the amount of iron in Mikayla's bloodstream (in milligrams) where t is measured in minutes since she ingested an iron supplement. What is the most appropriate interpretation of $g'(28) = 3.7$?

   (a) Twenty-eight minutes after ingesting the iron supplement, the amount of iron in Mikayla's bloodstream was growing at a rate of 3.7 milligrams per minute.

   (b) Twenty-eight minutes after ingesting the iron supplement, Mikayla had 3.7 milligrams of iron in her bloodstream.

   (c) The amount of iron in Mikayla's bloodstream grew by 3.7 milligrams during the 29th minute after she ingested the iron supplement.

   (d) On average, the amount of iron in Mikayla's bloodstream increased by 3.7 milligrams each minute over the first 28 minutes since she ingested the iron supplement.

   (e) The amount of iron in Mikayla's bloodstream grew by 3.7 milligrams during the first 28 minutes after she ingested the iron supplement.

5. Courtney is driving from Stillwater to Denver. The function $y = f(t)$ measures the amount of fuel Courtney's car has consumed (in gallons) where t is measured in hours since Courtney left Stillwater. What is the most appropriate interpretation of $f'(5) = 2.5$?

   (a) On average, the amount of fuel Courtney's car consumed increased by 2.5 gallons each hour over the first 5 hours since she left Stillwater.

   (b) Five hours after leaving Stillwater, the amount of fuel consumed Courtney's car was changing at a rate of 2.5 gallons per hour.

   (c) Courtney's car had 2.5 gallons of fuel in its tank 5 hours after leaving Stillwater.

   (d) The amount of fuel Courtney's car has consumed increased by 2.5 gallons during the 5th hour after she left Stillwater.

   (e) Courtney's car consumed 2.5 gallons of fuel during the first 5 hours of her drive from Stillwater to Denver.