2. When a certain grocery store opens, it has 50 pounds of bananas on a display table. Customers remove bananas from the display table at a rate modeled by

$$f(t) = 10 + (0.8t)\sin\left(\frac{t^3}{100}\right) \text{ for } 0 < t \le 12,$$

where $f(t)$ is measured in pounds per hour and t is the number of hours after the store opened. After the store has been open for three hours, store employees add bananas to the display table at a rate modeled by

$$g(t) = 3 + 2.4\ln\left(t^2 + 2t\right) \text{ for } 3 < t \le 12,$$

where $g(t)$ is measured in pounds per hour and t is the number of hours after the store opened.

(a) How many pounds of bananas are removed from the display table during the first 2 hours the store is open?

(b) Find $f'(7)$. Using correct units, explain the meaning of $f'(7)$ in the context of the problem.

(c) Is the number of pounds of bananas on the display table increasing or decreasing at time $t = 5$? Give a reason for your answer.

(d) How many pounds of bananas are on the display table at time $t = 8$?

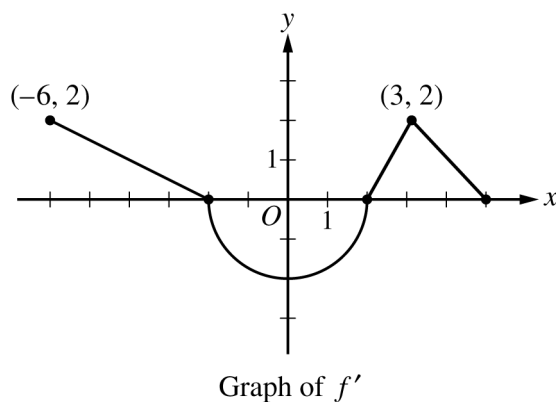---

END OF PART A OF SECTION II

GO ON TO THE NEXT PAGE.

CALCULUS AB

SECTION II, Part B

Time—1 hour

Number of questions—4

NO CALCULATOR IS ALLOWED FOR THESE QUESTIONS.

Graph of f'

3. The function f is differentiable on the closed interval $[-6, 5]$ and satisfies $f(-2) = 7$. The graph of f', the derivative of f, consists of a semicircle and three line segments, as shown in the figure above.

   (a) Find the values of $f(-6)$ and $f(5)$.

   (b) On what intervals is f increasing? Justify your answer.

   (c) Find the absolute minimum value of f on the closed interval $[-6, 5]$. Justify your answer.

   (d) For each of $f''(-5)$ and $f''(3)$, find the value or explain why it does not exist.

(a) $\int_0^2 f(t)\, dt = 20.051175$

$2 : \begin{cases} 1 : \text{integral} \\ 1 : \text{answer} \end{cases}$

20.051 pounds of bananas are removed from the display table during the first 2 hours the store is open.

(b) $f'(7) = -8.120$ (or -8.119)

$2 : \begin{cases} 1 : \text{value} \\ 1 : \text{meaning} \end{cases}$

After the store has been open 7 hours, the rate at which bananas are being removed from the display table is decreasing by 8.120 (or 8.119) pounds per hour per hour.

(c) $g(5) - f(5) = -2.263103 < 0$

$2 : \begin{cases} 1 : \text{considers } f(5) \text{ and } g(5) \\ 1 : \text{answer with reason} \end{cases}$

Because $g(5) - f(5) < 0,$ the number of pounds of bananas on the display table is decreasing at time $t = 5.$

(d) $50 + \int_3^8 g(t)\, dt - \int_0^8 f(t)\, dt = 23.347396$

$3 : \begin{cases} 2 : \text{integrals} \\ 1 : \text{answer} \end{cases}$

23.347 pounds of bananas are on the display table at time $t = 8.$