Accumulation Function Practice

1. The graph of the function f shown on the right consists of a semicircle and three line segments. Let g be the function given by

$$g(x) = \int_{-3}^{x} f(t)dt - 2$$

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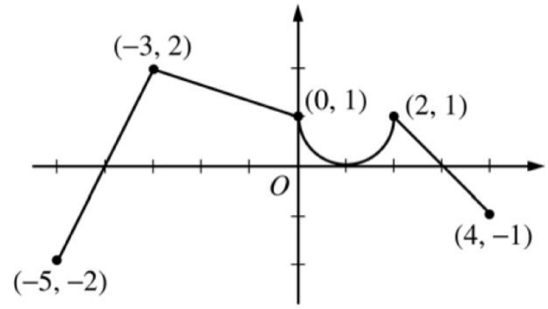


a. Find $g(0)$ and $g'(0)$.

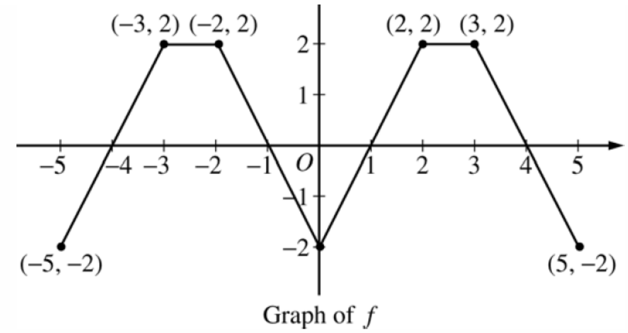
b. Find all values of x in the open interval $(-5, 4)$ at which g attains a local extremum. Justify your answer.

c. Find the absolute maximum and minimum value of g on the closed interval $[-5, 4]$. Justify your answer.

d. Find all values of x in the open interval $(-5, 4)$. At which the graph of g has a point of inflection.

e. Use technology to graph g

2. The graph of the function f shown to the right consists of six line segments.



Let g be the function given by

$$h(x) = \int_0^x f(t)dt$$

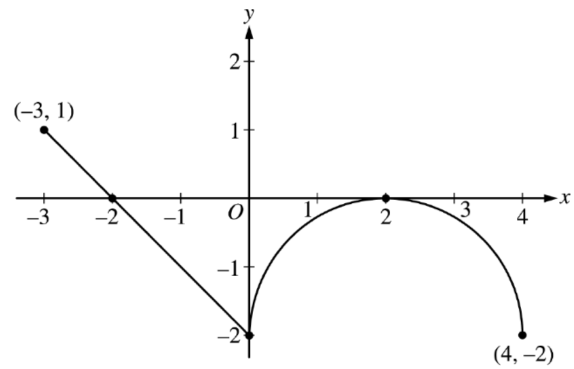
a. Find $h(4), h'(4), h''(4)$

b. Find all values of x in the open interval $(-5, 5)$ at which h attains a local extremum. Justify your answer.

c. Suppose f is defined for all real numbers and is periodic with a period of length 5. The graph above shows two periods of f. Linearize h at $x = 108$.

3. Let f be the piecewise function defined on $[-3, 4]$ whose graph is given on the right, and let

$$k(x) = \int_0^{2x} g(t)\, dt$$



a. What is the domain of k?

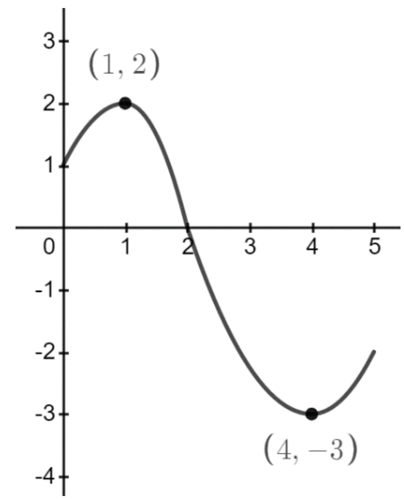
b. On what interval is k increasing?

c. Find the x values on the interval $(-3, 4)$ where k has a local extremum. Justify your answer.

d. Find the x-coordinate of each point of inflection of the graph of k on the open interval $(-3, 4)$. Justify your answer.

d. Use technology to graph k

4. Let f be a function whose domain is the closed interval $[0, 5]$. The graph of f is shown to the right. Let



$$m(x) = \int_{\frac{x}{2}+3}^{0} f(t)dt$$

a. What is the domain of m?

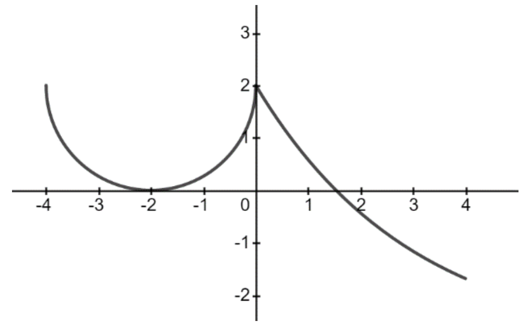
b. Find $m'(2)$

c. At what x is $m(x)$ a minimum?

d. Sketch m

5.

$$f'(x) = \begin{cases} -\sqrt{4-(x+2)^2}+2, & -4 \le x \le 0 \\ 5e^{-\frac{x}{3}} - 3, & 0 < x \le 4 \end{cases}$$



The graph of the continuous function $f'(x)$, shown in the figure above, has *x*-intercepts at $x = -2$ and $x = 3\ln\frac{5}{3}$. We also know that $f(0) = 5$.

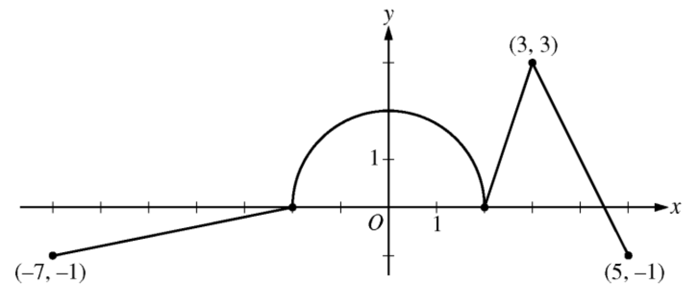
a. Write an equation for $f(x)$ using an accumulation function.

b. Find $f(-4)$ and $f(4)$

c. Find all values of $x \in (-4, 4)$ such that f has a point of inflection and a local extremum. Justify your answer.

d. Use technology to graph f.

6. The function g is defined and differentiable on the closed interval $[-7, 5]$ and satisfies $g(0) = 1$. The graph of $y = g'(x)$, the derivative of g, consists of a semi-circle and three line segments as shown on the figure to the side.



a. Write an equation for $g(x)$ using an accumulation function.

b. Find $g(-7)$ and $g(5)$

c. The function h is defined by $h(x) = g(x) - \frac{1}{2}x^2$. Find the x-coordinate of all critical points of h, where $-7 < x < 5$. Determine if they are local max/min or neither. Explain your reasoning.

d. Use technology to graph h