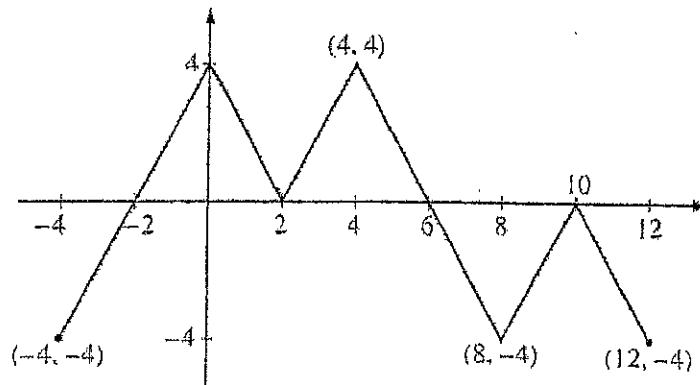


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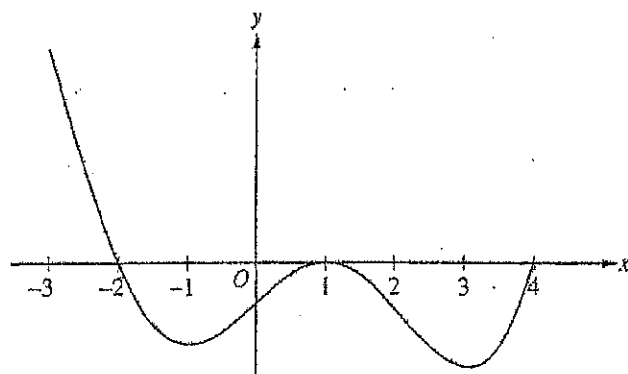
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Graph of  $f$

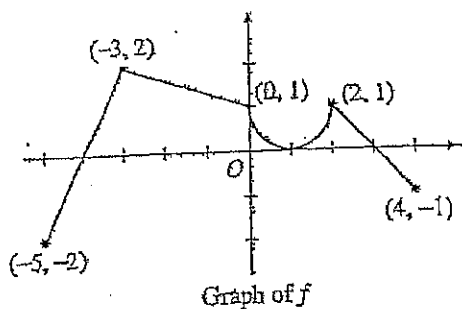
3. The figure above shows the graph of the piecewise-linear function  $f$ . For  $-4 \leq x \leq 12$ , the function  $g$  is defined by  $g(x) = \int_2^x f(t) dt$ .
- (a) Does  $g$  have a relative minimum, a relative maximum, or neither at  $x = 10$ ? Justify your answer.
  - (b) Does the graph of  $g$  have a point of inflection at  $x = 4$ ? Justify your answer.
  - (c) Find the absolute minimum value and the absolute maximum value of  $g$  on the interval  $-4 \leq x \leq 12$ . Justify your answers.
  - (d) For  $-4 \leq x \leq 12$ , find all intervals for which  $g(x) \leq 0$ .
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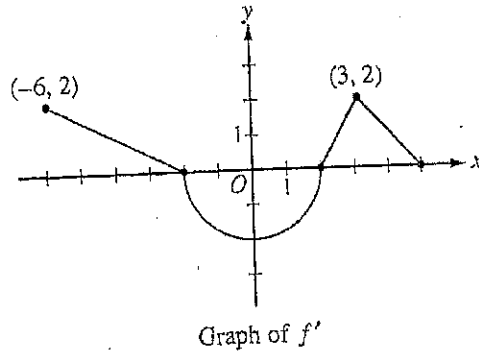
Graph of  $f'$

5. The figure above shows the graph of  $f'$ , the derivative of a twice-differentiable function  $f$ , on the interval  $[-3, 4]$ . The graph of  $f'$  has horizontal tangents at  $x = -1$ ,  $x = 1$ , and  $x = 3$ . The areas of the regions bounded by the  $x$ -axis and the graph of  $f'$  on the intervals  $[-2, 1]$  and  $[1, 4]$  are 9 and 12, respectively.
- Find all  $x$ -coordinates at which  $f$  has a relative maximum. Give a reason for your answer.
  - On what open intervals contained in  $-3 < x < 4$  is the graph of  $f$  both concave down and decreasing? Give a reason for your answer.
  - Find the  $x$ -coordinates of all points of inflection for the graph of  $f$ . Give a reason for your answer.
  - Given that  $f(1) = 3$ , write an expression for  $f(x)$  that involves an integral. Find  $f(4)$  and  $f(-2)$ .
-



5. The graph of the function  $f$  shown above consists of a semicircle and three line segments. Let  $g$  be the function given by  $g(x) = \int_{-3}^x f(t) dt$ .
- Find  $g(0)$  and  $g'(0)$ .
  - Find all values of  $x$  in the open interval  $(-5, 4)$  at which  $g$  attains a relative maximum. Justify your answer.
  - Find the absolute minimum value of  $g$  on the closed interval  $[-5, 4]$ . Justify your answer.
  - Find all values of  $x$  in the open interval  $(-5, 4)$  at which the graph of  $g$  has a point of inflection.

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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.
- Find the values of  $f(-6)$  and  $f(5)$ .
  - On what intervals is  $f$  increasing? Justify your answer.
  - Find the absolute minimum value of  $f$  on the closed interval  $[-6, 5]$ . Justify your answer.
  - For each of  $f''(-5)$  and  $f''(3)$ , find the value or explain why it does not exist.
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