

1. A particle moves along the  $x$ -axis so that at time  $t \geq 0$  its velocity is given by  $v(t) = -3t^2 + 24t + 99$ . Determine all intervals when the particle is moving to the left.

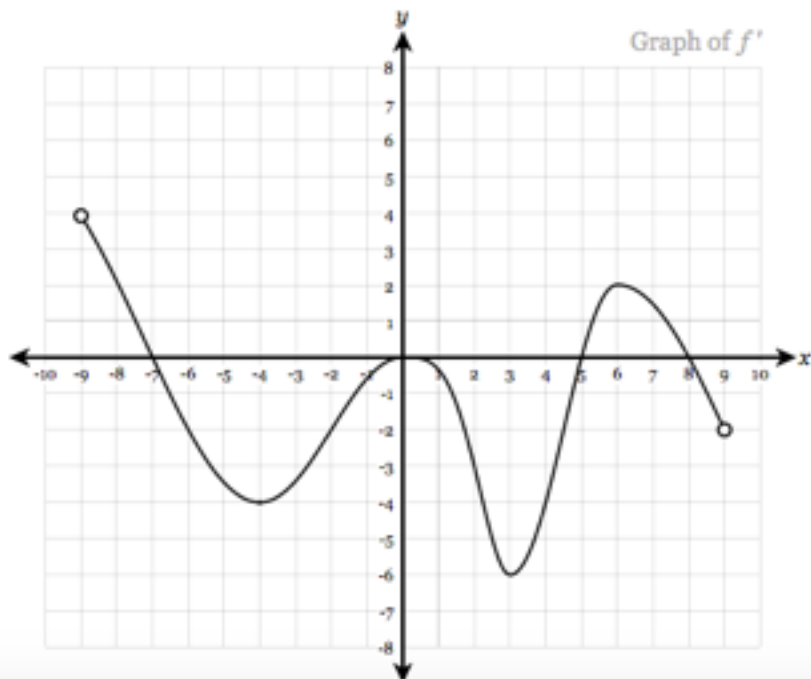
2. Selected values of the continuous function  $f$  are shown in the table below. It is known that  $f'(x) < 0$  for all  $x$  in the interval  $-1 \leq x \leq 3$ . Determine the validity of the following statement:

$f(x) = 4$  has exactly 1 solution in the interval  $-1 \leq x \leq 3$ .

| $x$ | $f(x)$ |
|-----|--------|
| -1  | 5      |
| 0   | 2      |
| 3   | -1     |

3. Given the function  $f(x) = x^4 + 4x^3$ , determine all intervals on which  $f$  is both increasing and concave up.

4. The graph of  $f'$ , the derivative of  $f$ , is shown below. Determine the values of  $x$ , if any, at which the function  $f$  has an inflection point on the interval  $(-9, 9)$ .



5. The twice-differentiable function  $f$  is shown below on the domain  $(-9, 9)$ . The function  $f$  has points of inflection at  $x = -7.6$ ,  $x = -1.8$ ,  $x = 3.2$ ,  $x = 7.5$ , shown with small green circles on the graph. Determine what could be said about the values of  $f(-4)$ ,  $f'(-4)$ , and  $f''(-4)$ .

