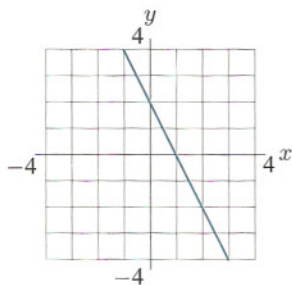


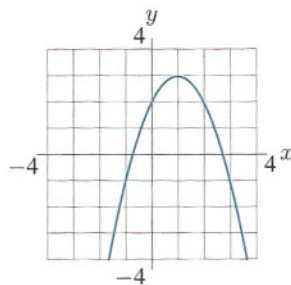
## Problems for Section 2.3

For Problems 1–9, sketch a graph of the derivative function of each of the given functions.

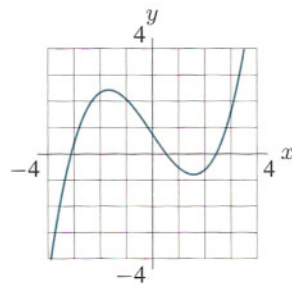
1.



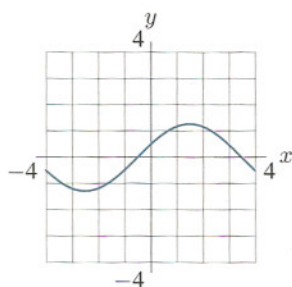
2.



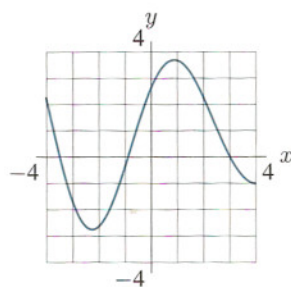
3.



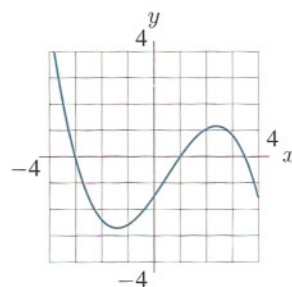
4.



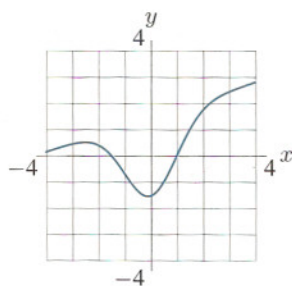
5.



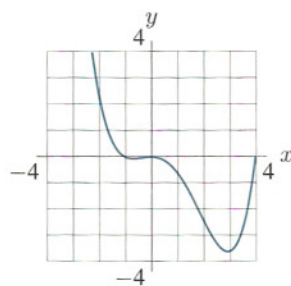
6.



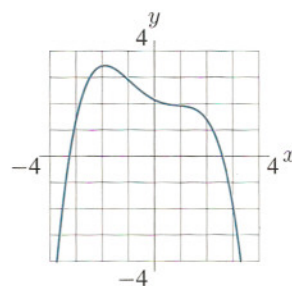
7.



8.



9.



10. (a) Sketch a smooth curve whose slope is both everywhere positive and increasing gradually.  
 (b) Sketch a smooth curve whose slope is both everywhere positive and decreasing gradually.  
 (c) Sketch a smooth curve whose slope is both everywhere negative and increasing gradually (i.e., becoming less and less negative).  
 (d) Sketch a smooth curve whose slope is both everywhere negative and decreasing gradually (i.e., becoming more and more negative).
11. Given the numerical values shown, find approximate values for the derivative of  $f(x)$  at each of the  $x$ -values given. Where is the rate of change of  $f(x)$  positive? Where is it negative? Where does the rate of change of  $f(x)$  seem to be greatest?

| $x$    | 0  | 1  | 2  | 3 | 4 | 5  | 6  | 7  | 8  |
|--------|----|----|----|---|---|----|----|----|----|
| $f(x)$ | 18 | 13 | 10 | 9 | 9 | 11 | 15 | 21 | 30 |

12. The values of  $x$  and the corresponding values of  $g(x)$  are given in the table. For what value of  $x$  is  $g'(x)$  closest to 3?

| $x$    | 2.7 | 3.2 | 3.7 | 4.2 | 4.7 | 5.2 | 5.7 | 6.2  |
|--------|-----|-----|-----|-----|-----|-----|-----|------|
| $g(x)$ | 3.4 | 4.4 | 5.0 | 5.4 | 6.0 | 7.4 | 9.0 | 11.0 |

Find a formula for the derivatives of the functions in Problems 13–16 algebraically.

13.  $g(x) = 2x^2 - 3$       14.  $k(x) = 1/x$       15.  $l(x) = 1/x^2$       16.  $m(x) = 1/(x+1)$

17. Draw the graph of a continuous function  $y = f(x)$  that satisfies the following three conditions.

- $f'(x) > 0$  for  $x < -2$ ,
- $f'(x) < 0$  for  $-2 < x < 2$ ,
- $f'(x) = 0$  for  $x > 2$ .

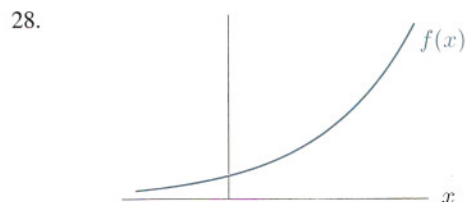
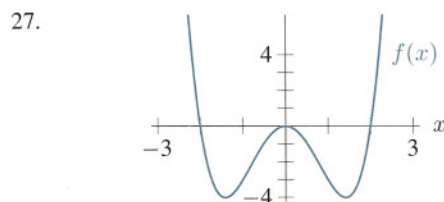
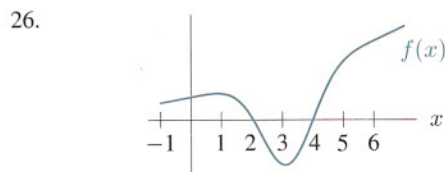
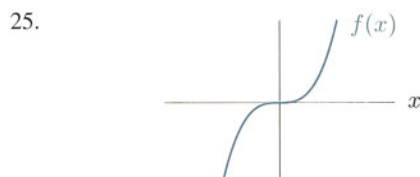
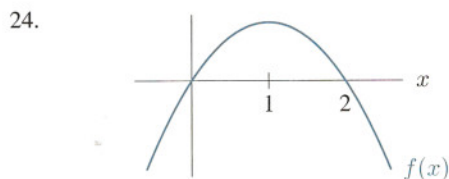
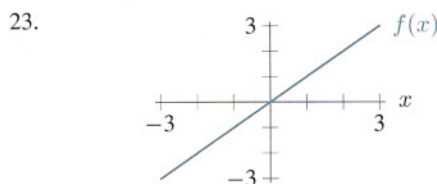
18. Draw the graph of a continuous function  $y = f(x)$  that satisfies the following three conditions.

- $f'(x) > 0$  for  $-\frac{\pi}{2} < x < \frac{\pi}{2}$ ,
- $f'(x) < 0$  for  $-\pi < x < -\frac{\pi}{2}$  and  $\frac{\pi}{2} < x < \pi$ ,
- $f'(x) = 0$  at  $x = -\frac{\pi}{2}$  and  $x = \frac{\pi}{2}$ .

For Problems 19–22, sketch the graph of  $f(x)$ , and use this graph to sketch the graph of  $f'(x)$ .

19.  $f(x) = x^2$       20.  $f(x) = x(x-1)$       21.  $f(x) = \cos x$       22.  $f(x) = \log x$

For Problems 23–28, sketch the graph of  $y = f'(x)$  for the function given.



29. In the graph of  $f$  in Figure 2.29, at which of the labeled  $x$ -values is

- (a)  $f(x)$  greatest?      (b)  $f(x)$  least?  
(c)  $f'(x)$  greatest?      (d)  $f'(x)$  least?

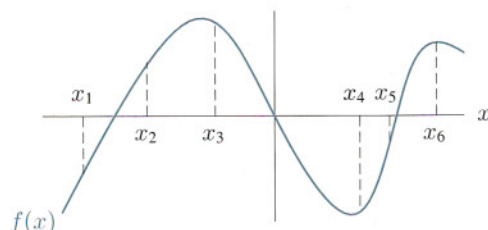


Figure 2.29