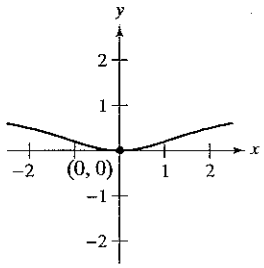
GIFT 4.1 (from Larson, Hostetler, page 160)

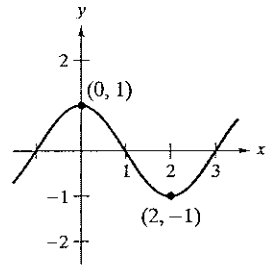
EXERCISES FOR SECTION 3.1

In Exercises 1–6, find the value of the derivative (if it exists) at each indicated extremum. ALSO STATE WHAT TYPE OF EXTREMUM.

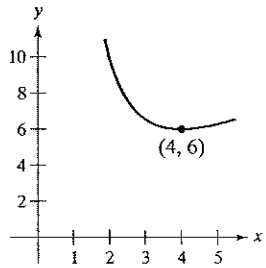
1. $f(x) = \dfrac{x^2}{x^2 + 4}$



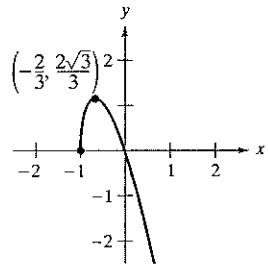
2. $f(x) = \cos\dfrac{\pi x}{2}$



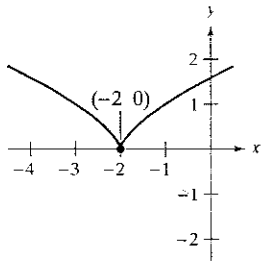
3. $f(x) = x + \dfrac{32}{x^2}$



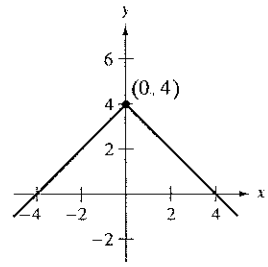
4. $f(x) = -3x\sqrt{x + 1}$



5. $f(x) = (x + 2)^{2/3}$



6. $f(x) = 4 - |x|$



In Exercises 7–12, find any critical numbers of the function.

7. $f(x) = x^2(x - 3)$
8. $g(x) = x^2(x^2 - 4)$
9. $g(t) = t\sqrt{4 - t}$
10. $f(x) = \dfrac{4x}{x^2 + 1}$
11. $h(x) = \sin^2 x + \cos x$, $0 \le x < 2\pi$
12. $f(\theta) = 2\sec\theta + \tan\theta$, $0 \le \theta < 2\pi$

In Exercises 13–26, determine the absolute extrema of the function and the x-value in the closed interval where it occurs.

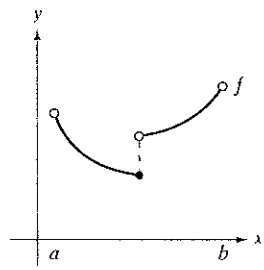
	Function	*Interval*
13.	$f(x) = 2(3 - x)$	$[-1, 2]$
14.	$f(x) = \dfrac{2x + 5}{3}$	$[0, 5]$
15.	$f(x) = -x^2 + 3x$	$[0, 3]$
16.	$f(x) = x^2 + 2x - 4$	$[-1, 1]$
17.	$f(x) = x^3 - 3x^2$	$[-1, 3]$
18.	$f(x) = x^3 - 12x$	$[0, 4]$
19.	$f(x) = 3x^{2/3} - 2x$	$[-1, 1]$
20.	$g(x) = \sqrt[3]{x}$	$[-1, 1]$
21.	$h(t) = 4 - \lvert t - 4\rvert$	$[1, 6]$
22.	$j(t) = 3 + \lvert 5 - t\rvert$	$[3, 6]$
23.	$h(s) = \dfrac{1}{s - 2}$	$[0, 1]$
24.	$h(t) = \dfrac{t}{t - 2}$	$[3, 5]$
25.	$f(x) = \cos \pi x$	$\left[0, \dfrac{1}{6}\right]$
26.	$g(x) = \csc x$	$\left[\dfrac{\pi}{6}, \dfrac{\pi}{3}\right]$

27. ***Writing*** Explain why the function $f(x) = \tan x$ has a maximum on $[0, \pi/4]$ but not on $[0, \pi]$.

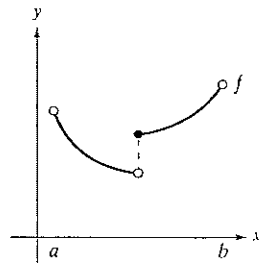
28. ***Writing*** Write a short paragraph explaining why a continuous function on an open interval may not have a maximum or minimum. Illustrate your explanation with a sketch of the graph of a function.

In Exercises 29–32, determine from the graph whether f has a minimum in the open interval (a, b).

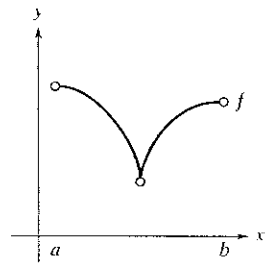
29. (a)



(b)



30. (a)



(b)