Chapter 3

Section 3.1 (page 169)

1. $f'(0) = 0$ **3.** $f'(2) = 0$ **5.** $f'(-2)$ is undefined.

7. 2, absolute maximum (and relative maximum)

9. 1, absolute maximum (and relative maximum);
2, absolute minimum (and relative minimum);
3, absolute maximum (and relative maximum)

11. $x = 0, x = 2$ **13.** $t = 8/3$ **15.** $x = \pi/3, \pi, 5\pi/3$

17. Minimum: $(2, 1)$
Maximum: $(-1, 4)$

19. Minimum: $(1, -1)$
Maximum: $(4, 8)$

21. Minimum: $\left(-1, -\frac{5}{2}\right)$
Maximum: $(2, 2)$

23. Minimum: $(0, 0)$
Maximum: $(-1, 5)$

25. Minimum: $(0, 0)$
Maxima: $\left(-1, \frac{1}{4}\right)$ and $\left(1, \frac{1}{4}\right)$

27. Minimum: $(1, -1)$
Maximum: $\left(0, -\frac{1}{2}\right)$

29. Minimum: $(-1, -1)$
Maximum: $(3, 3)$

31. Minimum value is -2 for $-2 \leq x < -1$.
Maximum: $(2, 2)$

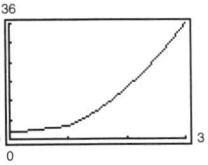
33. Minimum: $\left(1/6, \sqrt{3}/2\right)$
Maximum: $(0, 1)$

35. Minimum: $(\pi, -3)$
Maxima: $(0, 3)$ and $(2\pi, 3)$

37. (a) Minimum: $(0, -3)$;
Maximum: $(2, 1)$
(b) Minimum: $(0, -3)$
(c) Maximum: $(2, 1)$
(d) No extrema

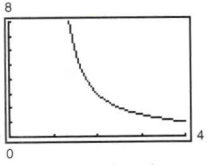
39. (a) Minimum: $(1, -1)$;
Maximum: $(-1, 3)$
(b) Maximum: $(3, 3)$
(c) Minimum: $(1, -1)$
(d) Minimum: $(1, -1)$

41.



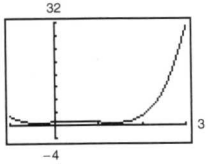
Minimum: (0, 2)
Maximum: (3, 36)

43.



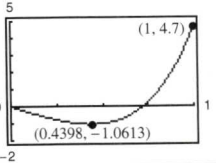
Minimum: (4, 1)

45.



Minima: $\left(\frac{-\sqrt{3}+1}{2}, \frac{3}{4}\right)$ and $\left(\frac{\sqrt{3}+1}{2}, \frac{3}{4}\right)$
Maximum: (3, 31)

47. (a)

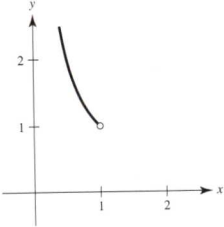


(b) Minimum: (0.4398, −1.0613)

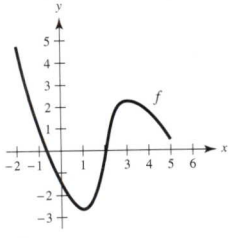
49. Maximum: $\left|f''\left(\sqrt[3]{-10+\sqrt{108}}\right)\right| = f''\left(\sqrt{3}-1\right) \approx 1.47$

51. Maximum: $\left|f^{(4)}(0)\right| = \frac{56}{81}$

53. Answers will vary. Let $f(x) = 1/x$. f is continuous on (0, 1) but does not have a maximum or minimum.



55. Answers will vary. Example:



57. (a) Yes (b) No **59.** (a) No (b) Yes

61. Maximum: $P(12) = 72$; No. P is decreasing for $I > 12$.

63. $\theta = \operatorname{arcsec} \sqrt{3} \approx 0.9553$ rad

65. True **67.** True **69.** Proof **71.** Putnam Problem B3, 2004