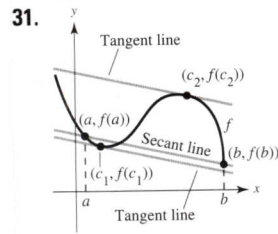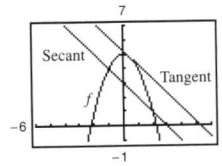**29.** (a) $f(1) = f(2) = 38$

(b) Velocity $= 0$ for some t in $(1, 2)$; $t = \frac{3}{2}$ sec

31.

33. The function is not continuous on $[0, 6]$.

35. The function is not continuous on $[0, 6]$.

37. (a) Secant line: $x + y - 3 = 0$ (b) $c = \frac{1}{2}$
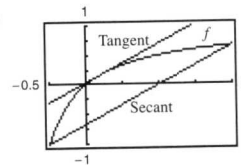
(c) Tangent line: $4x + 4y - 21 = 0$

(d)

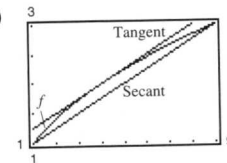**39.** $f'(-1/2) = -1$ **41.** $f'(1/\sqrt{3}) = 3, f'(-1/\sqrt{3}) = 3$

43. $f'(8/27) = 1$ **45.** f is not differentiable at $x = -\frac{1}{2}$.

47. $f'(\pi/2) = 0$

49. (a)–(c)

(b) $y = \frac{2}{3}(x - 1)$

(c) $y = \frac{1}{3}(2x + 5 - 2\sqrt{6})$

51. (a)–(c)

(b) $y = \frac{1}{4}x + \frac{3}{4}$

(c) $y = \frac{1}{4}x + 1$

53. (a) -14.7 m/sec   (b) 1.5 sec

55. No. Let $f(x) = x^2$ on $[-1, 2]$.

57. No. $f(x)$ is not continuous on $[0, 1]$. So it does not satisfy the hypothesis of Rolle's Theorem.

59. By the Mean Value Theorem, there is a time when the speed of the plane must equal the average speed of 454.5 miles/hour. The speed was 400 miles/hour when the plane was accelerating to 454.5 miles/hour and decelerating from 454.5 miles/hour.

61. Proof

63. (a)
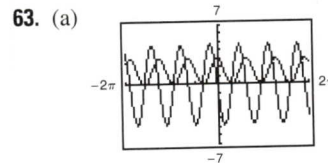
(b) Yes; yes

(c) Because $f(-1) = f(1) = 0$, Rolle's Theorem applies on $[-1, 1]$. Because $f(1) = 0$ and $f(2) = 3$, Rolle's Theorem does not apply on $[1, 2]$.

(d) $\lim_{x \to 3^-} f'(x) = 0$; $\lim_{x \to 3^+} f'(x) = 0$

Section 3.2   (page 176)

1. $f(-1) = f(1) = 1$; f is not continuous on $[-1, 1]$.

3. $f(0) = f(2) = 0$; f is not differentiable on $(0, 2)$.

5. $(2, 0), (-1, 0); f'(\frac{1}{2}) = 0$ **7.** $(0, 0), (-4, 0); f'(-\frac{8}{3}) = 0$

9. $f'(-1) = 0$ **11.** $f'(\frac{3}{2}) = 0$

13. $f'\left(\frac{6 - \sqrt{3}}{3}\right) = 0; f'\left(\frac{6 + \sqrt{3}}{3}\right) = 0$

15. Not differentiable at $x = 0$ **17.** $f'(-2 + \sqrt{5}) = 0$

19. $f'(\pi/2) = 0$; $f'(3\pi/2) = 0$ **21.** $f'(0.249) \approx 0$
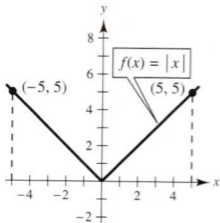
23. Not continuous on $[0, \pi]$

25.

Rolle's Theorem does not apply.

27.
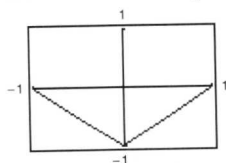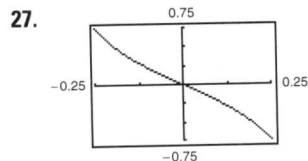
Rolle's Theorem does not apply.

65.

67. Proof **69.** Proof

71. $a = 6, b = 1, c = 2$ **73.** $f(x) = 5$ **75.** $f(x) = x^2 - 1$

77. False. f is not continuous on $[-1, 1]$. **79.** True

81–89. Proofs