Section 2.2 (page 115)

1. (a) $\frac{1}{2}$ (b) 3 **3.** 0 **5.** $7x^6$ **7.** $-5/x^6$ **9.** $1/(5x^{4/5})$

11. 1 **13.** $-4t + 3$ **15.** $2x + 12x^2$ **17.** $3t^2 + 10t - 3$

19. $\frac{\pi}{2}\cos\theta + \sin\theta$ **21.** $2x + \frac{1}{2}\sin x$ **23.** $-\frac{1}{x^2} - 3\cos x$

	Function	*Rewrite*	*Derivative*	*Simplify*
25.	$y = \dfrac{5}{2x^2}$	$y = \dfrac{5}{2}x^{-2}$	$y' = -5x^{-3}$	$y' = -\dfrac{5}{x^3}$
27.	$y = \dfrac{6}{(5x)^3}$	$y = \dfrac{6}{125}x^{-3}$	$y' = -\dfrac{18}{125}x^{-4}$	$y' = -\dfrac{18}{125x^4}$
29.	$y = \dfrac{\sqrt{x}}{x}$	$y = x^{-1/2}$	$y' = -\dfrac{1}{2}x^{-3/2}$	$y' = -\dfrac{1}{2x^{3/2}}$

31. -2 **33.** 0 **35.** 8 **37.** 3 **39.** $2x + 6/x^3$

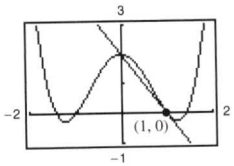
41. $2t + 12/t^4$ **43.** $8x + 3$ **45.** $(x^3 - 8)/x^3$

47. $3x^2 + 1$ **49.** $\frac{1}{2\sqrt{x}} - \frac{2}{x^{2/3}}$ **51.** $\frac{4}{5s^{1/5}} - \frac{2}{3s^{1/3}}$

53. $\frac{3}{\sqrt{x}} - 5\sin x$

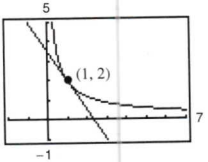
55. (a) $2x + y - 2 = 0$

(b)



57. (a) $3x + 2y - 7 = 0$

(b)

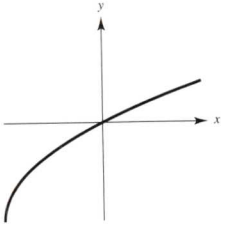


59. $(-1, 2), (0, 3), (1, 2)$ **61.** No horizontal tangents

63. (π, π) **65.** $k = -1,\ k = -9$

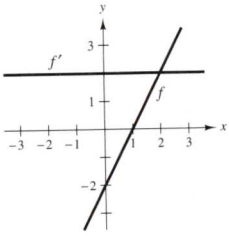
67. $k = 3$ **69.** $k = 4/27$

71.



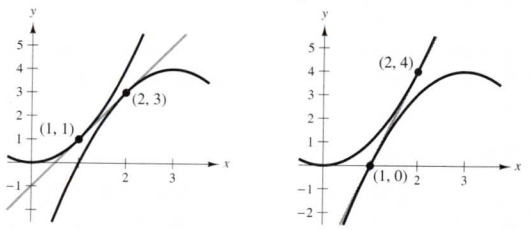
73. $g'(x) = f'(x)$

75.



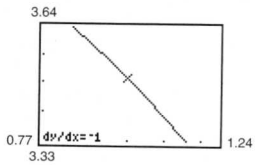
The rate of change of f is constant and therefore f' is a constant function.

77. $y = 2x - 1$ $y = 4x - 4$



79. $f'(x) = 3 + \cos x \neq 0$ for all x. **81.** $x - 4y + 4 = 0$

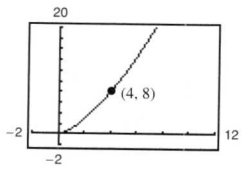
83.



$f'(1)$ appears to be close to -1.

$f'(1) = -1$

85. (a)

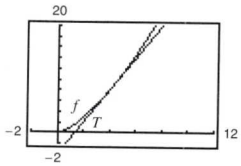


(3.9, 7.7019),
$S(x) = 2.981x - 3.924$

(b) $T(x) = 3(x - 4) + 8 = 3x - 4$

The slope (and equation) of the secant line approaches that of the tangent line at (4, 8) as you choose points closer and closer to (4, 8).

(c)



The approximation becomes less accurate.

(d)

Δx	-3	-2	-1	-0.5	-0.1	0
$f(4 + \Delta x)$	1	2.828	5.196	6.548	7.702	8
$T(4 + \Delta x)$	-1	2	5	6.5	7.7	8

Δx	0.1	0.5	1	2	3
$f(4 + \Delta x)$	8.302	9.546	11.180	14.697	18.520
$T(4 + \Delta x)$	8.3	9.5	11	14	17

87. False. Let $f(x) = x$ and $g(x) = x + 1$.

89. False. $dy/dx = 0$ **91.** True

93. Average rate: 4
Instantaneous rates:
$f'(1) = 4; f'(2) = 4$

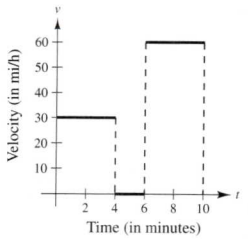
95. Average rate: $\frac{1}{2}$
Instantaneous rates:
$f'(1) = 1; f'(2) = \frac{1}{4}$

97. (a) $s(t) = -16t^2 + 1362$; $v(t) = -32t$ (b) -48 ft/sec
(c) $s'(1) = -32$ ft/sec; $s'(2) = -64$ ft/sec

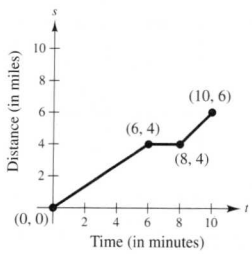
(d) $t = \dfrac{\sqrt{1362}}{4} \approx 9.226$ sec (e) -295.242 ft/sec

99. $v(5) = 71$ m/sec; $v(10) = 22$ m/sec

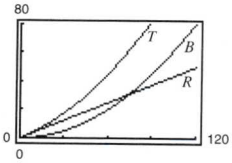
101.



103.



105. (a) $R(v) = 0.417v - 0.02$
(b) $B(v) = 0.0056v^2 + 0.001v + 0.04$
(c) $T(v) = 0.0056v^2 + 0.418v + 0.02$
(d)



(e) $T'(v) = 0.0112v + 0.418$
$T'(40) = 0.866$
$T'(80) = 1.314$
$T'(100) = 1.538$

(f) Stopping distance increases at an increasing rate.

107. $V'(6) = 108$ cm^3/cm **109.** Proof

111. (a) The rate of change of the number of gallons of gasoline sold when the price is \$2.979

(b) In general, the rate of change when $p = 2.979$ should be negative. As prices go up, sales go down.

113. $y = 2x^2 - 3x + 1$ **115.** $9x + y = 0, 9x + 4y + 27 = 0$

117. $a = \frac{1}{3}, b = -\frac{4}{3}$

119. $f_1(x) = |\sin x|$ is differentiable for all $x \neq n\pi$, n an integer.
$f_2(x) = \sin|x|$ is differentiable for all $x \neq 0$.