Section 2.5 (page 146)

1. $-x/y$ **3.** $-\sqrt{y/x}$ **5.** $(y - 3x^2)/(2y - x)$

7. $(1 - 3x^2y^3)/(3x^3y^2 - 1)$

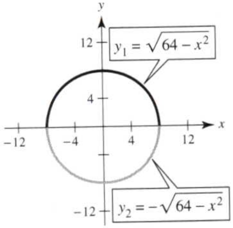
9. $(6xy - 3x^2 - 2y^2)/(4xy - 3x^2)$

11. $\cos x/[4 \sin (2y)]$ **13.** $(\cos x - \tan y - 1)/(x \sec^2 y)$

15. $[y \cos(xy)]/[1 - x \cos(xy)]$

17. (a) $y_1 = \sqrt{64 - x^2}$; $y_2 = -\sqrt{64 - x^2}$

(b)

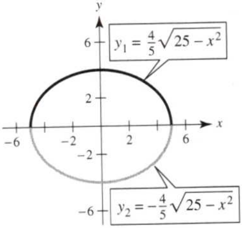


(c) $y' = \mp \dfrac{x}{\sqrt{64 - x^2}} = -\dfrac{x}{y}$

(d) $y' = -\dfrac{x}{y}$

19. (a) $y_1 = \frac{4}{5}\sqrt{25 - x^2}$; $y_2 = -\frac{4}{5}\sqrt{25 - x^2}$

(b)



(c) $y' = \mp \dfrac{4x}{5\sqrt{25 - x^2}} = -\dfrac{16x}{25y}$

(d) $y' = -\dfrac{16x}{25y}$

21. $-\dfrac{y}{x}, -\dfrac{1}{6}$ **23.** $\dfrac{98x}{y(x^2 + 49)^2}$, Undefined **25.** $-\sqrt[3]{\dfrac{y}{x}}, -\dfrac{1}{2}$

27. $-\sin^2(x + y)$ or $-\dfrac{x^2}{x^2 + 1}, 0$ **29.** $-\dfrac{1}{2}$ **31.** 0

33. $y = -x + 7$ **35.** $y = -x + 2$

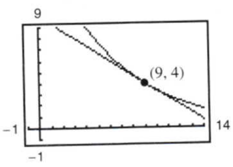
37. $y = \sqrt{3}x/6 + 8\sqrt{3}/3$ **39.** $y = -\frac{2}{11}x + \frac{30}{11}$

41. (a) $y = -2x + 4$ (b) Answers will vary.

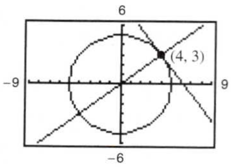
43. $\cos^2 y, \ -\dfrac{\pi}{2} < y < \dfrac{\pi}{2}, \ \dfrac{1}{1 + x^2}$ **45.** $-4/y^3$

47. $-36/y^3$ **49.** $(3x)/(4y)$

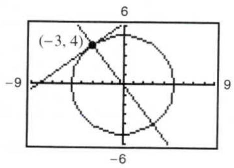
51. $2x + 3y - 30 = 0$



53. At $(4, 3)$:
Tangent line: $4x + 3y - 25 = 0$
Normal line: $3x - 4y = 0$



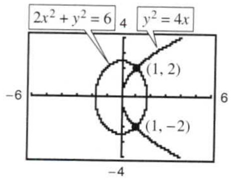
At $(-3, 4)$:
Tangent line: $3x - 4y + 25 = 0$
Normal line: $4x + 3y = 0$



55. $x^2 + y^2 = r^2 \Rightarrow y' = -x/y \Rightarrow y/x =$ slope of normal line. Then for (x_0, y_0) on the circle, $x_0 \neq 0$, an equation of the normal line is $y = (y_0/x_0)x$, which passes through the origin. If $x_0 = 0$, the normal line is vertical and passes through the origin.

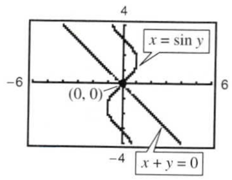
57. Horizontal tangents: $(-4, 0), (-4, 10)$
Vertical tangents: $(0, 5), (-8, 5)$

59.



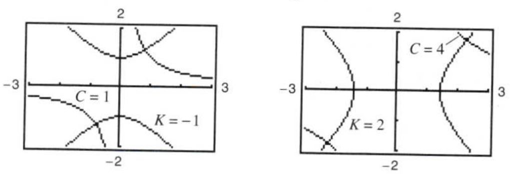
At $(1, 2)$:
Slope of ellipse: -1
Slope of parabola: 1
At $(1, -2)$:
Slope of ellipse: 1
Slope of parabola: -1

61.



At $(0, 0)$:
Slope of line: -1
Slope of sine curve: 1

63. Derivatives: $\dfrac{dy}{dx} = -\dfrac{y}{x}, \dfrac{dy}{dx} = \dfrac{x}{y}$

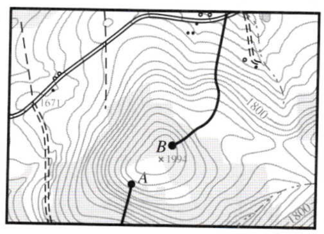


65. (a) $\dfrac{dy}{dx} = \dfrac{3x^3}{y}$ (b) $y\dfrac{dy}{dt} = 3x^3\dfrac{dx}{dt}$

67. (a) $\dfrac{dy}{dx} = \dfrac{-3\cos \pi x}{\sin \pi y}$ (b) $-\sin \pi y\left(\dfrac{dy}{dt}\right) = 3\cos \pi x\left(\dfrac{dx}{dt}\right)$

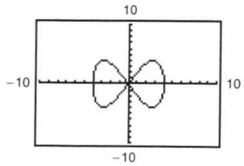
69. Answers will vary. In the explicit form of a function, the variable is explicitly written as a function of x. In an implicit equation, the function is only implied by an equation. An example of an implicit function is $x^2 + xy = 5$. In explicit form it would be $y = (5 - x^2)/x$.

71.

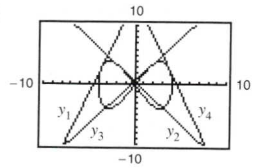


Use starting point B.

73. (a)



(b)



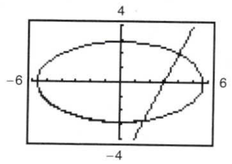
(c) $\left(\dfrac{8\sqrt{7}}{7}, 5\right)$

$y_1 = \frac{1}{3}\left[(\sqrt{7} + 7)x + (8\sqrt{7} + 23)\right]$
$y_2 = -\frac{1}{3}\left[(-\sqrt{7} + 7)x - (23 - 8\sqrt{7})\right]$
$y_3 = -\frac{1}{3}\left[(\sqrt{7} - 7)x - (23 - 8\sqrt{7})\right]$
$y_4 = -\frac{1}{3}\left[(\sqrt{7} + 7)x - (8\sqrt{7} + 23)\right]$

75. Proof **77.** $(6, -8), (-6, 8)$

79. $y = -\dfrac{\sqrt{3}}{2}x + 2\sqrt{3},\ y = \dfrac{\sqrt{3}}{2}x - 2\sqrt{3}$

81. (a) $y = 2x - 6$
(b)



(c) $\left(\frac{28}{17}, -\frac{46}{17}\right)$