

3.6 Exercises

4. $x^2 + y^2 = 1$

$$\frac{d}{dx}(x^2 + y^2) = \frac{d}{dx}(1)$$

$$2x + 2y(dy/dx) = 0$$

$$2y(dy/dx) = -2x$$

$$-x/y$$

8. $xy = 12$

$$\frac{d}{dx}(xy) = \frac{d}{dx}(12)$$

$$y + x(dy/dx) = 0$$

$$dy/dx = -y/x$$

12. $x^3 + 2xy^2 + y^3 = 1$

$$\frac{d}{dx}(x^3 + 2xy^2 + y^3) = \frac{d}{dx}(1)$$

$$3x^2 + 4y^2(dy/dx) + 3y^2(dy/dx) = 0$$

$$(3x^2 + 7y^2)(dy/dx) = 0$$

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

16. $x^2 + y^2 = xy + 4$

$$dy/dx = (y - 2x)/(2y - x)$$

32. $8p^2 + 2p + 100 = x$

$$16p(dp/dx) + 2(dp/dx) = 1$$

$$(dp/dx)(16p + 2) = 1$$

$$dp/dx = 1/(16p + 2)$$

36. $(p - 1)(x + 5) = 24$

$$dy/dx = y(dp/dx)/(x + 5)$$

40. $(x^2 + y^2)^2 + 2x^3 = 6xy^2$ at $(1, 1)$

$$2(x^2 + y^2)(2x + 2y(dy/dx)) + 6x^2 = 6y^2 + 12xy$$

$$4x(x^2 + y^2) + 4y^2(x + y(dy/dx)) + 6x^2 = 6y^2 + 12xy$$

$$dy/dx = (-2)/16 = -1/8$$

44. $x^2 = 8000 + 5p^2$ at $p = 80$

$$2x(dx/dp) = 10p(dp/dp)$$

$$dx/dp = 5p x / x^2 = 5p/x$$

$$x^2 = 8000 + 5p^2 = 8000 + 5(80)^2 =$$

increase by 1

56. $2x^3 - 5xy = 14$

48. $(um)(vn) = 14$

$$(um)'(vn) + (um)(vn)' = 0$$

$$du/dv = -1/v$$

52. $x^3 - y^3 = 1$

$$d(xy)/dt + d(y^4)/dt$$

64. $r = 0.002p^{3/2}$
 $p = 40,000$

72. $5x^3 = 20,000 + 2p^2$
 $5x^3 + 2(100)^2 = 20,000$
 $5x^3 = 16,000$
 $x^3 = 3,200$
 $x = (3,200)^{1/3}$
 $dx/dt \approx 0.66$

80. $du/dt = -2000$

46. 58 accidents
per year