10. $2x^2 + y^2 = 16$, $4x + 2y\dfrac{dy}{dx} = 0$ and $\dfrac{dy}{dx} = -\dfrac{2x}{y}$.

14. $x^2 + 5xy + y^2 = 10$. Differentiating both sides of the equation implicitly, we obtain $2x + 5y + 5xy' + 2yy' = 0$, $2x + 5y + y'(5x + 2y) = 0$ and so $y' = -\dfrac{2x+5y}{5x+2y}$.

16. $x^2y^3 - 2xy^2 = 5$. Differentiating both sides of the equation implicitly, we obtain $2xy^3 + 3x^2y^2y' - 2y^2 - 4xyy' = 0$, $2y^2(xy-1) + xy(3xy-4)y' = 0$,

So $$y' = \frac{2y(1-xy)}{x(3xy-4)}.$$

18. $x^{1/3} + y^{1/3} = 1$. Differentiating both sides of the equation implicitly, we obtain $\frac{1}{3}x^{-2/3} + \frac{1}{3}y^{-2/3}y' = 0$ and so $y' = -\dfrac{x^{-2/3}}{y^{-2/3}} = -\dfrac{y^{2/3}}{x^{2/3}} = -\left(\dfrac{y}{x}\right)^{2/3}$.

19. $\sqrt{x+y} = x$. Differentiating both sides of the equation implicitly, we obtai

$$\tfrac{1}{2}(x+y)^{-1/2}(1+y') = 1,\ 1+y' = 2(x+y)^{1/2},$$

or $$y' = 2\sqrt{x+y} - 1.$$

23. $\sqrt{xy} = x + y$. Differentiating both sides of the equation implicitly, we obta

$$\tfrac{1}{2}(xy)^{-1/2}(xy'+y) = 1 + y'$$

$$xy' + y = 2\sqrt{xy}(1+y')$$

$$y'(x - 2\sqrt{xy}) = 2\sqrt{xy} - y$$

or $$y' = -\frac{(2\sqrt{xy} - y)}{(2\sqrt{xy} - x)} = \frac{2\sqrt{xy} - y}{x - 2\sqrt{xy}}.$$

25. $\dfrac{x+y}{x-y} = 3x$, or $x + y = 3x^2 - 3xy$. Differentiating both sides of the equation implicitly, we obtain $1 + y' = 6x - 3xy' - 3y$ or $y' = \dfrac{6x - 3y - 1}{3x+1}$.

30. $(x + y^2)^{10} = x^2 + 25$. Differentiating both sides of the equation with respect to x, we obtain $10(x + y^2)^9(1 + 2yy') = 2x$, or $y' = \dfrac{x - 5(x+y^2)^9}{10y(x+y^2)^9}$.

32. $y^2 - x^2 = 16$. Differentiating both sides of the equation implicitly, we obtain $2yy' - 2x = 0$. At the point $(2, 2\sqrt{5})$, we have $4\sqrt{5}y' - 4 = 0$, or $m = \frac{1}{\sqrt{5}} = \frac{\sqrt{5}}{5}$.

Using the point–slope form of an equation of a line, we have $y = \frac{\sqrt{5}}{5}x + \frac{8\sqrt{5}}{5}$.

42. $p = \frac{1}{2}x^2 + 48$. Differentiating implicitly, we have

$$\frac{dp}{dt} - x\frac{dx}{dt} = 0, \text{ and } -x\frac{dx}{dt} = -\frac{dp}{dt}, \quad \text{or } \frac{dx}{dt} = \frac{\frac{dp}{dt}}{x}.$$

When $x = 6$, $p = 66$, and $\frac{dp}{dt} = -3$, we have $\frac{dx}{dt} = -\frac{3}{6} = -\frac{1}{2}$,

or $(-\frac{1}{2})(1000) = -500$ tires/week.

43. $100x^2 + 9p^2 = 3600$. Differentiating the given equation implicitly with respect to t, we have $200x\frac{dx}{dt} + 18p\frac{dp}{dt} = 0$. Next, when $p = 14$, the given equation yields

$$100x^2 + 9(14)^2 = 3600$$
$$100x^2 = 1836,$$

or $x = 4.2849$. When $p = 14$, $\frac{dp}{dt} = -0.15$, and $x = 4.2849$, we have

$$200(4.2849)\frac{dx}{dt} + 18(14)(-0.15) = 0$$
$$\frac{dx}{dt} = 0.0441.$$

So the quantity demanded is increasing at the rate of 44 ten–packs per week.

48. $V = x^3$. $\frac{dV}{dt} = 3x^2\frac{dx}{dt} \Rightarrow \frac{dV}{dt} = 3(25)(0.1) = 7.5$ cu in/sec.

60. Differentiating $x^2 + y^2 = 400$ with respect to t gives $2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 0$.

When $x = 12$, we have $144 + y^2 = 400$, or $y = \sqrt{256} = 16$. Therefore, with $x = 12$, $\frac{dx}{dt} = 5$, and $y = 16$, we find $2(12)(5) + 2(16)\frac{dy}{dt} = 0$, or $\frac{dy}{dt} = -3.75$, that is, the top of the ladder is sliding down the wall at 3.75 ft/sec.