

36.
 $x^2 y^2 - 2x = 3$

$$x^2 \cdot 2y \frac{dy}{dx} + 2xy^2 - 2 = 0$$

$$\frac{dy}{dx} = \frac{-2xy^2 - 2}{2x^2y} = \frac{-xy^2 - 1}{x^2y}$$

$$\frac{dy}{dx} = \frac{-xy^2 - 1}{x^2y} \quad \frac{d\left(\frac{u}{v}\right)}{dx} = \frac{vdu - udv}{v^2}$$

$$\frac{d^2y}{dx^2} = \frac{x^2y \cdot (-x \cdot 2y \frac{dy}{dx} + y^2(-1)) - \dots}{v^2}$$

$$\frac{d^2y}{dx^2} = \frac{-2x^3y^2 \frac{dy}{dx} - y^2 - ((-xy^2 - 1)(2xy + x^2 \frac{dy}{dx}))}{x^4y^2}$$

$$\frac{d^2y}{dx^2} = \frac{-2x^3y^2 \frac{dy}{dx} - y^2 + 2x^2y^3 + x^3y \frac{dy}{dx} + 2xy + x^2 \frac{dy}{dx}}{x^4y^2}$$

$$\frac{d^2y}{dx^2} = \frac{(-x^3y^2 + x^2) \frac{dy}{dx} + 2x^2y^3 + 2xy - y^2}{x^4y^2}$$

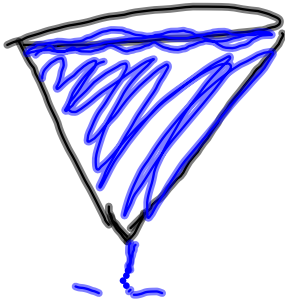
$$\frac{d^2y}{dx^2} = \frac{(-x^3y^2 + x^2) \left(\frac{-xy^2 - 1}{x^2y}\right) + 2x^2y^3 + 2xy - y^2}{x^4y^2}$$

$$\frac{-x^4y^4 + x^3y^2 - x^3y^2 - x^2}{x^2y} + 2x^2y^3 + 2xy - y^2$$

$$\frac{\dots}{x^4y^2}$$

$$\frac{-x^2y^3 + xy - xy - y^{-1} + 2x^2y^3 + 2xy - y^2}{x^{4-1}y^2}$$

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



$$V = \frac{\pi}{3} r^2 h$$

$$\frac{dV}{dt} = \frac{\pi}{3} \left(3r^2 \frac{dr}{dt} h + \frac{dh}{dt} r^2 \right)$$

$y = x^2 + 3$ Find $\frac{dy}{dt}$ when $x=1$
 + $\frac{dx}{dt} = 2$

$$\frac{dy}{dt} = 2x \frac{dx}{dt}$$

$$\frac{dy}{dt} = 2 \cdot 1 \cdot 2 = 4$$

Find $\frac{dx}{dt}$
 when $x=3$
 given $\frac{dy}{dt} = 4$

$$xy = 6$$

$$x \cdot \frac{dy}{dt} + \frac{dx}{dt} y = 0$$

$$3 \cdot 4 + \frac{dx}{dt} \cdot y = 0$$

$$\frac{dx}{dt} \cdot y = -12$$

$$2 \frac{dx}{dt} = -12$$

$$\frac{dx}{dt} = -6$$

$3y = 6$
 $y = 2$

$$y = 9 + 6y \quad -3y = 9 \quad \text{Find } \frac{dy}{dt}$$

$$y = -9/5 \quad \text{when } x = 3$$

$$y = x^2 + 2xy \quad \text{given } \frac{dx}{dt} = 2$$

$$\frac{dy}{dt} = 2x \frac{dx}{dt} + 2 \frac{dx}{dt} \cdot y + 2x \frac{dy}{dt}$$

$$\frac{dy}{dt} = 6 \cdot 2 + 2 \cdot 2 \cdot y + 2 \cdot 3 \cdot \frac{dy}{dt}$$

$$\frac{dy}{dt} = 12 + 4y + 6 \frac{dy}{dt}$$

$$-6 \frac{dy}{dt}$$

$$\frac{-5 \frac{dy}{dt}}{-5} = \frac{12 + 4(-9/5)}{-5}$$

$$\frac{dy}{dt} = -0.96$$