Implicit Differentiation Practice

Find dy/dx.

1. $\sin(y)+xy^3=3x$

$\cos(y)\frac{dy}{dx} + x\,3y^2\frac{dy}{dx} + y^3 = 3$ $\quad \frac{dy}{dx} = \frac{3-y^3}{\cos(y)+3xy^2}$

2. $4x^2y^3+3yx^3=2x$

$4x^2 3y^2\frac{dy}{dx} + 8xy^3 + y\,9x^2 + \frac{dy}{dx}3x^3 = 2$ $\quad \frac{dy}{dx} = \frac{2-8xy^3-9x^2y}{4x^2 3y^2+3x^3}$

$12x^2y^2$

3. $xy+e^{2y+1}=2x$

$x\frac{dy}{dx} + y + e^{2y+1}\cdot 2\frac{dy}{dx} = 2$ $\quad \frac{dy}{dx} = \frac{2-y}{x+2e^{2y+1}}$

4. $y^3+xy=3y$

$3y^2\frac{dy}{dx} + x\frac{dy}{dx} + y = 3\frac{dy}{dx}$ $\quad \frac{dy}{dx} = \frac{-y}{3y^2+x-3}$

Find d^2y/dx^2.

5. $2y-3x^2=xy$

$2\frac{dy}{dx} - 6x = x\frac{dy}{dx} + y$ $\quad \frac{dy}{dx} = \frac{y+6x}{2-x}$ $\quad \frac{d^2y}{dx^2} = \frac{(2-x)(6+\frac{y+6x}{2-x}) + (y+6x)}{(2-x)^2}$ or $\frac{(2-x)(6+\frac{dy}{dx}) - (y+6x)(-1)}{(2-x)^2}$

$\frac{(2-x)(6+\frac{y+6x}{2-x}) + (y+6x)}{(2-x)^2}$

6. Find the equations of the tangent and normal line to the curve $xy^2=16$ at (1, 4).

tangent $y-4=-2(x-1)$

normal $y-4=\frac{1}{2}(x-1)$

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

$1\cdot 2(4)\frac{dy}{dx} + 4^2 = 0$

$8\frac{dy}{dx} + 16 = 0$

$\frac{-16}{8} = \frac{8\frac{dy}{dx}}{8}$

$-2 = \frac{dy}{dx}$