4.2 Day 2

Friday, October 7, 2016 9:16 AM

Find $\frac{dy}{dx}$ of $x^2+2y^3=3$

$2x+6y^2\cdot y'=0$

$6y^2y'=-2x$

$y'=\frac{-2x}{6y^2}=\frac{-x}{3y^2}$ $\quad \frac{dy}{dx}=\frac{-x}{3y^2}=y'$

$\frac{d^2y}{dx^2}=?$ $\quad \frac{d^2y}{dx^2}=\frac{3y^2(-1)-(-x)(6y)\cdot y'}{(3y^2)^2}$

$=\frac{-3y^2+6xy\left(\frac{-x}{3y^2}\right)}{9y^4}$

$=\frac{-3y^2+\frac{-2x^2}{y}}{9y^4}$

$=\left(\frac{-3y^2}{1}-\frac{2x^2}{y}\right)\cdot\frac{1}{9y^4}$

$=\frac{-3y^2}{y\,9y^4}-\frac{2x^2}{9y^5}=\frac{-3y^3-2x^2}{9y^5}$

Find $\frac{d^2y}{dx^2}$ of $x^2+y^2=4$

$2x+2yy'=0$ $\quad y'=\frac{-2x}{2y}$ $\quad y'=\frac{dy}{dx}=\frac{-x}{y}$

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

$=\frac{-y+\frac{-x^2}{y}}{y^2}=\left(\frac{-y}{1}+\frac{-x^2}{y}\right)\cdot\frac{1}{y^2}$

$=\frac{-y}{y\,y^2}+\frac{-x^2}{y^3}=\frac{-y^2-x^2}{y^3}=\frac{-1(y^2+x^2)}{y^3}=\frac{-1(4)}{y^3}=\frac{-4}{y^3}$