Math 16A

Vogler

Understanding Implicit Differentiation

Ex Consider the equation $x^2+y^2=9$, and the following cases:

1) Assume $y=f(x)$ and $D=\frac{d}{dx}$,

$\Rightarrow \frac{d}{dx}[x^2+y^2=9] \Rightarrow 2x+2y\frac{dy}{dx}=0$

2) Assume $x=f(y)$ and $D=\frac{d}{dy}$,

$\Rightarrow \frac{d}{dy}[x^2+y^2=9] \Rightarrow 2x\frac{dx}{dy}+2y=0$

3) Assume $x=f(t)$ but y is <u>NOT</u> a function of t and $D=\frac{d}{dt} \Rightarrow \frac{d}{dt}[x^2+y^2=9] \Rightarrow 2x\frac{dx}{dt}+0=0$

4) Assume $x=f(t)$, $y=h(t)$, and $D=\frac{d}{dt}$

$\Rightarrow \frac{d}{dt}[x^2+y^2=9] \Rightarrow 2x\frac{dx}{dt}+2y\frac{dy}{dt}=0$

Moral: The outcome of implicit differentiation depends on <u>both</u> the 'invisible' (assumed) function(s) and the variable you are taking the derivative with respect to.