AP Calculus AB
Tuesday, October 29, 2013

Bellwork:

Find the equation of the tangent line to $\sqrt{x}+\sqrt{y-1}=y$ at $(9,4)$

$y=(\quad)^3$

$y'=3x^2\cdot\frac{dx}{dx}$

$\frac{dy}{dx}=3x^2$

$y=(ex)^3$

$y'=3(ex)^2\cdot e$

(ODDS on Implicit Diff. Homework)

$\frac{d}{dx}\left[x^2y+xy^2=2x\right]$ @ (1,1)

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

$x^2y'+2xy+2xy\cdot y'+y^2=2$

$y'(x^2+2xy)=-2xy-y^2+2$

$y'=\frac{-2xy-y^2+2}{x^2+2xy}$

@ (1,1)

$y'=\frac{-2-1+2}{1+2}=-\frac{1}{3}$

slope @ (1,1) is $-\frac{1}{3}$.

$y-1=-\frac{1}{3}(x-1)$

$y-1=-\frac{1}{3}x+\frac{1}{3}$

$y=-\frac{1}{3}x+\frac{4}{3}$

Example 4) Find $\frac{dy}{dx}$ for $y+\sqrt{xy}=2$ at $(2,2)$

$$\frac{dy}{dx}+\frac{1}{2\sqrt{xy}}\left(x\frac{dy}{dx}+y\right)=0$$

$$\frac{dy}{dx}+\frac{1}{4}\left(2\frac{dy}{dx}+2\right)=0$$

$$\frac{dy}{dx}+\frac{1}{2}\frac{dy}{dx}=-\frac{1}{2}$$

$$\frac{dy}{dx}=\frac{-1}{3}$$

$(xy)^{1/2}$

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

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

Example 5) Find $\frac{dy}{dx}$ for $(x+y)^2+y=2$ at $(0,1)$

$$2(x+y)\left(1+\frac{dy}{dx}\right)+\frac{dy}{dx}=0$$

$$2+2\frac{dy}{dx}+\frac{dy}{dx}=0$$

$$\frac{dy}{dx}=\frac{-2}{3}$$

$(x+y)^2+y=2$

$2(x+y)'(1+y')+y'=0$

Example 7) Find $\frac{dy}{dx}$ for $\sin(xy)=1$

$(2x+2y)(1+y')+y'=0$

$$\sin(xy)=1$$

$$\cos(xy)\left(x\frac{dy}{dx}+y\right)=0$$

$2x+2y+2xy'+2yy'+y'=0$

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

$y'(2x+2y+1)=-2x-2y$

$$\frac{dy}{dx}=\frac{-y}{x}$$

$$y'=\frac{-2x-2y}{2x+2y+1}$$

@ $(0,1)$: $y'=\frac{-2}{3}$

Example 6) Find $\frac{dy}{dx}$ for $x^2+4y^2=4$ at $(2,0)$

$$x^2+4y^2=4 \text{ at } (2,0)$$

$$2x+8y\frac{dy}{dx}=0$$

$$4+0\frac{dy}{dx}=0$$

$$\frac{dy}{dx} \text{ DNE}$$