Math 1151, Implicit Differentiation Activity, Fall 2014 Name KEY

Instructions: Find y' for each of the implicit functions below.

1. $\sqrt{x}+\sqrt{y}=16$

$x^{1/2}+y^{1/2}=16$

$\frac{1}{2}x^{-1/2}+\frac{1}{2}y^{-1/2}y'=0$

$\left(\frac{1}{2}x^{-1/2}=-\frac{1}{2}y^{-1/2}y'\right)2\sqrt{y}$

$-\frac{\sqrt{y}}{\sqrt{x}}=y'$

2. $x^5-xy+y^2=7$

$5x^4-y-xy'+2yy'=0$

$y'(-x+2y)=y-5x^4$

$y'=\frac{y-5x^4}{2y-x}$

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

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

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

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

4. $e^{xy}y^3-y=x$

$e^{xy}(y+xy')y^3+e^{xy}3y^2y'-y'=1$

$y^4e^{xy}+xy^3e^{xy}y'+3y^2e^{xy}y'-y'=1-y^4e^{xy}$

$y'=\frac{1-y^4e^{xy}}{xy^3e^{xy}+3y^2e^{xy}-1}$

5. $\sin(x)=x(1-\tan(y+x))$

$\cos x=1-\tan(y+x)+x\sec^2(y+x)(y'+1)$

$\cos x-1+\tan(y+x)-x\sec^2(y+x)=x\sec^2(y+x)y'$

$y'=\frac{\cos x-1+\tan(y+x)-x\sec^2(y+x)}{x\sec^2x(y+x)}$

6. $\ln(xy)+5x=30$

$\ln x+\ln y+5x=30$

$\frac{1}{x}+\frac{1}{y}y'+5=0$

$\frac{y'}{y}=\left(-\frac{1}{x}-5\right)y$

$y'=-\frac{y}{x}-5y$