



## Handout 10

## MATH 140 Lab: Section 1

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Student's Name:-----

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*Note: This handout contains a review for some important things in implicit differentiation.*

- If you have a math problem and you need to use implicit differentiation by differentiating  $y$  with respect to  $x$ , you have to know the following (**PLEASE go over them and read them carefully**):
- **First of all, PLEASE know that  $y' = \frac{dy}{dx}$**
- **Second, read the following carefully, and take into your account that you have to multiply by  $y'$  when you differentiate  $y$  with respect to  $x$ .**

**Implicit Derivatives:**

- 1- The derivative of  $y^3$  is  $3y^2y'$
- 2- The derivative of  $y^2$  is  $2yy'$
- 3- The derivative of  $y$  is  $y'$
- 4- The derivative of  $e^y$  is  $e^y \cdot y'$
- 5- The derivative of  $e^{2y}$  is  $2e^y \cdot y'$
- 6- The derivative of  $\sin(y)$  is  $\cos(y) \cdot y'$
- 7- The derivative of  $\ln(y)$  is  $\frac{1}{y} \cdot y'$
- 8- The derivative of  $\ln(3y + 1)$  is  $\frac{3}{(3y+1)} \cdot y'$
- 9- The derivative of  $x \sin(y)$  is a **product rule** as follows:  
 $\sin(y) + x \cos(y) \cdot y'$
- 10- The derivative of  $x e^y$  is a **product rule** as follows:  
 $e^y + x e^y \cdot y'$
- 11- The derivative of  $\frac{x}{y^2+2}$  is a **quotient rule** as follows:

$$\frac{(y^2 + 2)(1) - (2yy')(x)}{(y^2 + 2)^2}$$

- 12- The derivative of  $\tan(y)$  is:  $\sec^2 y \cdot y'$
- 13- The derivative of  $\cot(y)$  is:  $-\csc^2 y \cdot y'$
- 14- The derivative of  $\sec(y)$  is:  $\sec(y) \tan(y) \cdot y'$
- 15- The derivative of  $\csc(y)$  is:  $-\csc(y) \cot(y) \cdot y'$

**Dear Implicit  
Differentiation**

We know that you are scary!!!, and you are trying to scare us (non-mathematicians), but there is an interactive way of thinking that we can use it to overcome our fear from you!!!

The way is to read Kaabar handout and notes