Recitation on Implicit Differentiation

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Goal:

- Examples on Implicit Differentiation
- Practice Implicit Differentiation
- Take the quiz

To do implicit differentiation:

- Express $y = y(x)$
- Use chain rule to differentiate the given equation in x, y.
- Collect all the terms involving y' to left side of the equation and move everything else to the right side of the equation.
- Isolate y' and solve y' from the equation.

- Use implicit differentiation to find y' if $x - sec(xy) = y^2$.

  Solution:
  1^0 First, we write it as $x - \sec(xy(x)) = y(x)^2$. Now differentiate both sides to get

  $$[x - \sec(xy(x))]' = [y(x)^2]'.$$

  This implies that $x' - [\sec(xy(x))]' = 2y(x)y'(x)$

  $$1 - \sec(xy(x))\tan(xy(x))(xy(x))' = 2y(x)y'(x)$$

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

  $$1 - \sec(xy(x))\tan(xy(x))y(x) \underbrace{- \sec(xy(x))\tan(xy(x))xy'(x)}$$
  $$= \underbrace{2y(x)y'(x)}$$

2^0 From
$1 - \sec(xy(x))\tan(xy(x))y(x)\underbrace{- \sec(xy(x))\tan(xy(x))xy'(x)}$
$= \underbrace{2y(x)y'(x)}$,

we get
$-\sec(xy)\tan(xy)xy' - 2yy' = -1 + \sec(xy)\tan(xy)y$

and $y'(-\sec(xy)\tan(xy)x - 2y) = -1 + \sec(xy)\tan(xy)y$.

This implies that $y' = \frac{-1+\sec(xy)\tan(xy)y}{-\sec(xy)\tan(xy)x-2y}$

In the tangent line or normal line problem: After we get the formula of $y'(x)$ in terms of (x, y).

The slope of the tangent line at a point (x_0, y_0) is $y'(x)|_{(x_0,y_0)}$

and the slope of the normal line is $-\frac{1}{y'(x)|_{(x_0,y_0)}}$ if $y'(x)|_{(x_0,y_0)} \neq 0$

the the normal line is $x = x_0$ if $y'(x)|_{(x_0,y_0)} = 0$

Now Login MYMATHLAB
`http://portal.mypearson.com/cclogin.jsp` and work on practice for quiz (in Homework, Practice problem for quiz on Oct 14) and take the quiz (in Quizzes and Tests ,Quiz on Oct 14) when you are done.