APCAL Lesson 2.5--Implicit Differentiation

BELL: Read p 137

Implicit differentiation is used when y can not be solve for "explicitly"...like we're used to doing

$y = 3x^2 - 5$ and $f(x) = (4x^3 - 5x^2 + 2)^3$

$xy = 1$ can be written as $y = 1/x$ and then differntiated

But with $x^2 - 2y^3 + 4y = 2$ we can't solve for y explicitly SO we must differentiate this equation "implicitly"

Now, in order to do this you must be one thing in your head... Y represents some function of x...so when differentiating an expression with respect to x you must use the chain rule ex: $\frac{d}{dx}[y^3]$

Think of y as some function like $4x^2 - 6x$ for example

ex: $\frac{d}{dx}[(4x^2 - 6x)^3] = 3(4x^2 - 6x)^2 \cdot (8x - 6)$

BUT you don't know what y is....you must still use the chain rule

ex: $\frac{d}{dx}[y^3] = 3y^2 \cdot \frac{dy}{dx}$

b/c you don't know what y is you can't find the derivative (dy/dx), so you just have to put "dy/dx"....if you think about it, it's really LESS WORK!

$\frac{d}{dx}[y] = \frac{dy}{dx}$ $\frac{d}{dx}[x] = ??$

$$\frac{d}{dx}[2y^5] = 10y^4 \frac{dy}{dx}$$

$$\frac{d}{dx}[x + 3y^2] = \frac{d}{dx}[x] + \frac{d}{dx}[3y^2] = 1 + 6y \cdot \frac{d}{dx}$$

$$\frac{d}{dx}[xy^2] = x \cdot \frac{d}{dx}[y^2] + y^2 \cdot \frac{d}{dx}[x] = x \cdot 2y \cdot \frac{d}{dx} + y^2 \cdot 1$$

product rule

$$= 2xy \frac{dy}{dx} + y^2$$

other examples...

ex 4

ex 2

ex 5 (be smart here!)

ex 7...d^2y/dx^2

ex 8...last one!