Implicit Differentiation

- Used when taking the derivative of more than one variable.

- Whenever you take a derivative of something other than x, you must chain-rule along its "qualifier".

- Standard power, chain, product, and quotient rules apply.

- Applications include Related Rates.

Implicit Differentiation Process

1) Differentiate both sides of equation with respect to x.
2) Collect $\frac{dy}{dx}$ or $\frac{dA}{db}$ etc on one side of equation
3) Factor out the "qualifier" is necessary $\left(\frac{dy}{dx}\right)$
4) Solve for "qualifier"

What is implicit differentiation used for?

- Find the slope of a tangent line to:
  a) Circles
  b) tangent lines to a lens
  c) Measurement calculations by the Hubble telescope
  d) Light rays entering Earth's atmosphere, etc.

Find the derivatives:

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

2) $2x + y = 9$

3) $\frac{y}{|x|} = 6x + 3$

4) $y^2 - 2y = 3x$

5) $x^2 + y^2 = 100$

6) $x^3 + y^3 = 18xy$

7) $y^2 = \frac{x-1}{x+1}$

8) $x^2y + xy^2 = 6$

H.W

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