DO NOW

Differentiate: $x^2y + y^2x = -3$

$x^2y' + y(2x) + y^2(1) + x(2yy') = 0$

$x^2y' + 2xyy' = -2xy - y^2$

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

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

OR

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

3.5 Implicit Differentiation- Day 2

To find the second derivative implicitly:

*First find: 1st derivative

*Then find: 2nd derivative

↳ substitute the 1st derivative into the 2nd derivative to put in terms of x and y

1. Find $\frac{d^2y}{dx^2}$ in terms of x and y using the function: $2x^3 - 3y^2 = 8$

$6x^2 - 6yy' = 0$

$6x^2 = 6yy'$

$\frac{6x^2}{6y} = y'$

$\frac{x^2}{y} = y'$

$y' = \frac{x^2}{y}$

2nd derivative

$y'' = \frac{y(2x) - x^2 \cdot y'}{y^2}$ ← substitute y' in

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

$y'' = \frac{2xy^2 - x^4}{y^3}$ ← multiply num. and denom by y

2. Find $\frac{d^2y}{dx^2}$ given that $y^2 + 2y = 2x + 1$

$2yy' + 2y' = 2$

$y'(2y + 2) = 2$

$y' = \frac{2}{2y+2}$

$y' = \frac{2}{2(y+1)}$

$y' = \frac{1}{y+1}$

$y' = (y+1)^{-1}$

$y'' = -1(y+1)^{-2} \cdot y'$

$y'' = \frac{-1}{(y+1)^2} \cdot \frac{1}{y+1}$

$y'' = \frac{-1}{(y+1)^3}$

3. Find $\frac{d^2y}{dx^2}$ given that $x^2 + y^2 = 36$

$2x + 2yy' = 0$

$2yy' = -2x$

$y' = \frac{-2x}{2y}$

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

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

$y'' = \frac{-y + x\left(\frac{-x}{y}\right)}{y^2}$ ← sub in y'

$y'' = \frac{-y^2 - x^2}{y^3}$

$y'' = \frac{-1(y^2 + x^2)}{y^3}$ ← original $x^2 + y^2 = 36$

$y'' = \frac{-36}{y^3}$

HOMEWORK

pg 171 - 173; 12, 16, 18, 25 - 43 odd
53, 55