

WRITE YOUR NAME:

MAC 2302 Quiz 5  
Tuesday September 17th

Solve the differential equation.

$$\underbrace{(3x^2 + 2xy)}_M dx + \underbrace{(x^2 - 3y^2)}_N dy = 0$$

Check if DE is exact:  $\frac{\partial M}{\partial y} = 0 + 2x \cdot 1 = 2x$

$\frac{\partial N}{\partial x} = 2x - 0 = 2x$ . Yes, DE is exact.

$$\frac{\partial F}{\partial x} = M = 3x^2 + 2xy$$

↓ integrate wrt x

$$F = x^3 + x^2y + g(y) \quad \text{since } g(y) \text{ is const wrt } x$$

↓ diff. wrt y

$$\frac{\partial F}{\partial y} = 0 + x^2 \cdot 1 + g'(y) = x^2 + g'(y)$$

This must be  
 $N = x^2 - 3y^2$

So  $g'(y) = -3y^2 \Rightarrow g(y)$  can be  $-y^3$

$\Rightarrow F$  can be  $x^3 + x^2y - y^3$

SOLUTION to DE is  $x^3 + x^2y - y^3 = C$