Part II: Write your solutions in the space below each problem.

1. Consider the implicit curve C defined by the equation

$$C : \ln(x^2 + 1) + \ln(y^2 + 1) = \ln 5.$$

[4] (i) Determine $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ and $\dfrac{\mathrm{d}x}{\mathrm{d}y}$.

Solution: Let $\ln(x^2+1)+\ln(y^2+1) = \ln(5)$ and take the derivative of both sides with respect to x:

$$\frac{2x}{x^2+1} + \frac{2yy'}{y^2+1} = 0.$$

Now we have to solve for y'. Start by clearing denominators, by multiplying both sides by $(x^2+1)(y^2+1)$:

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

From here we can isolate $y' = dy/dx$:

$$\frac{dy}{dx} = \frac{-x(y^2+1)}{}$$