

Name: _____ Section: _____

You must show all your work to receive credit. Calculators are allowed.

Problem 1: (3 points) Find the implicit general solution to the equation

$$\frac{dy}{dx} = \frac{-\cos x - \ln y}{\frac{x}{y} + e^y}$$

$$(\cos x + \ln y) dx + \left(\frac{x}{y} + e^y\right) dy = 0$$

$$\downarrow \frac{\partial}{\partial y}$$

$$\downarrow \frac{\partial}{\partial x}$$

$$\frac{1}{y}$$

$$\frac{1}{y}$$

they agree, so is exactneed to find $H(x, y)$ with

$$\begin{cases} \frac{\partial H}{\partial x} = \cos x + \ln y & (1) \\ \frac{\partial H}{\partial y} = \frac{x}{y} + e^y & (2) \end{cases}$$

From (1), $H = \int (\cos x + \ln y) dx = \sin x + x \ln y + C(y)$

Using (2), $\frac{x}{y} + e^y = \frac{\partial H}{\partial y} = \frac{x}{y} + C'(y)$

so $C'(y) = e^y$ and $C(y) = e^y$

Thus $H = \sin x + x \ln y + e^y$ and general soltn. is

$$\boxed{\sin x + x \ln y + e^y = C}$$