UCONN - Math 3410 - Fall 2017 - Solution to Graded Problems of HW1

Question 1 (5 Points) *Show that $e^{2x} + e^{2y} = 1$ is an implicit solution to the DE*

$$e^{x-y} + e^{y-x}\frac{dy}{dx} = 0.$$

Solution: There are different ways to show (probably more);

1st way is to rewrite the DE as

$$e^{2x} + e^{2y}\frac{dy}{dx} = 0$$

and this DE has solution (one can integrate above DE to get)

$$e^{2x} + e^{2y} = c_1$$

and choosing $c_1 = 1$ gives us desired solution.

2nd way is to differentiate the implicit solution with respect to x

$$e^{2x} + e^{2y} = 1$$

which gives

$$0 = 2e^{2x} + 2e^{2y}y'$$

Multiply everything by $e^{-x-y} > 0$ and (factor out 2) to get

$$0 = e^{x-y} + e^{y-x}y'$$

which is the desired DE.

Question 2 (5 Points) *Construct a direction field for the differential equation $y' = 2x$.*

Solution: The direction field is