

**Each group only needs to submit ONE file containing your solutions!**

**Problem 1.** Consider the planar system

$$\frac{d}{dt} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -e^x(y-1) \\ e^x(x^2-4) \end{pmatrix}$$

- (1) Solve the orbit equation. Is it a Hamiltonian system? Is it a conservative system? (Hint: recall that one can try an integrating factor which is either a function of  $x$  or a function of  $y$ )
- (2) Find all stationary points and determine their type by linearization. Determine whether they are stable/unstable/attracting/repelling. Sketch them in a picture.