Homework 7

Problem 1. [Strogatz 8.1.1] For the following prototypical examples, plot the phase portraits as $\mu$ varies:

a) $\dot{x} = \mu x - x^2$, $\dot{y} = -y$ (transcritical bifurcation)

b) $\dot{x} = \mu x + x^3$, $\dot{y} = -y$ (subcritical pitchfork bifurcation)

Problem 2. [Strogatz 8.1.7] Find and classify all bifurcations for the system

$$
\dot{x} = y - ax,
\dot{y} = -by + \frac{x}{1+x}.
$$

Problem 3. [Strogatz 8.2.1] Consider the biased van der Pol oscillator $\ddot{x} + \mu(x^2 - 1)\dot{x} + x = a$. Find the curves in $(\mu, a)$ space at which Hopf bifurcations occur.