1. Follow the instructions of Strogatz, Problem 6.1.1-6 for the system
   \[ \dot{x} = x^3 - y, \quad \dot{y} = x + y \]

2. Follow the instructions of Strogatz, Problem 6.1.8-11 for the system
   \[ \dot{x} = y^3, \quad \dot{y} = -x + y(1 - x^4) \]

3. Strogatz, Problem 6.1.11.


5. Follow the instructions of Strogatz, Problem 6.3.1-6 for the system
   \[ \dot{x} = y - x^3, \quad \dot{y} = 4 - y + x^2 \]

6. Strogatz, Problem 6.3.7 (only for the system in problem 5).

7. Strogatz, Problem 6.3.11.

8. Strogatz, Problem 6.5.19. (e) Also find an approximate equation for the orbits close to the fixed point (1, 1) and describe them. Does linearization correctly predict the type of this fixed point?

9. (a) Strogatz, Problem 6.8.4.

   (b) Repeat part (a) for the system \( \dot{x} = x^3 - 3xy^2, \quad \dot{y} = 3x^2y - y^3 \).

10. Strogatz, Problem 6.8.8. Show that at least one of the fixed points in the region bounded by \( C_1, C_2, \) and \( C_3 \) must, in fact, be a saddle.