TOPICS COVERED

Limit Cycles
- Significance of limit cycles vs centers
- Examples using polar coordinates
- Van der Pool Equation

Ruling out Closed Orbits
- Linear systems
- Conservative systems
- Gradient systems, Liapunov functions

Poincare-Bendixon Theorem
- Determines everything that can possibly happen in 2D!
- Finding trapping regions

Reading: Strogatz, Sections 7.0-7.3

1. (a,b) Problems 7.1.1, 7.1.3

2. Problem 7.1.5

3. Problem 7.1.7

4. (a,b) Problem 7.2.1, 7.2.2.

5. Problem 7.2.8 (Hint: Let \((x(t), y(t))\) be a parametrization of an equipotential curve. That is, this is not a solution curve but a curve along which \(V(x(t), y(t))\) is constant. Find a vector \(t\) that is tangent to this equipotential curve. You want to show that \(t\) and \(\nabla V\) are perpendicular to each other. Use the equation \(V(x(t), y(t)) = c.\)

6. Problem 7.2.9

7. Problem 7.2.10

8. Problem 7.3.3 (Hint: Show that the trajectories leave small circles but enter large circles, forming a trapping region that contains no equilibria.)