

Possible topics for student talks.

1. Solve AND discuss extensions of any assigned HW.
2. Talk on any of the papers or topics I link to or reference on the class web site.
3. Come up with your own topic! Make sure it fits within the broad confines of “dynamical systems”.
4. Talk about an “elementary” topic that we need to cover, including, but not limited to:
 - A. Straightening lemma (also called the “flow box lemma”)
 - B. Autonomous linear systems: $\dot{X} = AX$ and e^{tA}
 - C. Prove the relation between instability / stability of linearization and that of map or flow nearby to a fixed point.
 - D. The Poincaré-Hopf formula.
 - E. The Lefschetz fixed point formula.
5. Talk about a more advanced topic, covered in the texts.
 - A. The Melnikov method, applied to establish transverse intersections of stable and unstable manifolds for the perturbed pendulum $\ddot{\theta} = -\sin(\theta) + \epsilon \cos(t)$. Eg Guck-Holmes.
 - B. the Van der Pol Oscillator. eg: Guckenheimer-Holmes.
 - C. Show that one of the Bernoulli coincidences described in Brin actually holds.
 - D. the Henon map (see his original paper)
6. Miscellany:
 - A. Investigate time periodic perturbations of gradient flows. Start with $\ddot{\theta} = -\sin(\theta) + \epsilon \cos(t)$.
 - B. Describe the Pugh-Donnay -Anosov geodesic flows that are embedded in Euclidean 3-space. Reference: Merry-Paternain, around p. 37.
 - C. Integrating the pendulum equation using elliptic functions. (Eg: Lawden or Mumford’s paper)
 - D. Discuss Cartwright and Littlewood paper, 1945 . See Guckenheimer and Holmes reference.
 - E. Go through Moser’s paper on regularizing the Kepler problem by using stereo projection
 - F. Go through Henon’s paper.
 - G. Go through the article in the latest (October) Monthly by Pesin et al on Equilibrium (SRB) Measures.