Homework 4

due on November 4, 2015

1. Read sections 3.1, 3.2 in Peskin/Hoppensteadt and do problems 3.1, 3.3, 3.4 in the end of chapter 3 (p. 144).

2. Read sections 3.3, 3.4 in Peskin/Hoppensteadt and do problem 3.5 in the end of chapter 3 (p. 145).

3. Water poisoning (intoxication) or *dilutional hyponatremia* is a pathological condition caused by over-hydration, which results in unsafe low levels (concentration) of electrolytes in the body. This causes more extracellular fluids shifting into the cells, causing their swelling. Research the pathology of water intoxication, and write a 2-paragraph summary of your findings. Include a discussion of how exactly the low concentration of sodium in extracellular solution effects the volume of the cell in our models.

4. Find partners for your group projects, and choose a topic for investigation. You can choose from the following list of possible projects, or suggest your own. The prospectus for the project is due with this assignment (short description of what you will be doing). The first drafts of the projects will be due in early December, with the final papers/presentations/posters due during the final week of classes.

   1. Renal countercurrent mechanism (chapter 4 in the book)
   2. Muscle mechanics (chapter 5 in the book)
   3. Propagation of annual plants (difference equations)
   4. Red blood cell production (difference equations)
   5. Delivery of drugs with continuous infusion (ODEs)
   6. Chemotactic motion of microorganisms (PDEs)
   7. Temperature-Dependent sex determination in crocodilia (ODEs)
   8. Dynamics of marital interaction (difference equations)
   9. Evolutionary game theory
   10. HIV infection dynamics (ODEs)
   11. Tumor growth (ODEs/PDEs)
   12. Neural coding (probability)
   13. Enzyme kinetics (ODEs)
   14. any other math bio model...