**Midterm Exam**

**Due:** Wednesday, October 12, 2022, 1:00 PM

**Abilities to be Tested**

1. Formulate a verbal description as a differential equations model and interpret solutions of such a model.

2. Solve first-order differential equations using integrating factors, separation of variables, guess and check, slope field sketches, phase line sketches, and Euler’s numerical approximation. Identify equilibria and their stability properties. Apply the Existence and Uniqueness Theorem properly.

3. Solve constant coefficient linear second-order differential equations analytically using guess and check and undetermined coefficients.  Identify natural and resonant frequencies.  Describe the importance of resonance.

4. Estimate best fit parameters to models that can be expressed linearly.

**Study Suggestions**

1. Ask yourself which of the above abilities you already have. For the ones that are weak, reread the text and/or lecture notes.

2. Rework a selection of text and assignment problems.

3. Prepare a review sheet. Although the midterm exam is closed book, the act of preparing a reference sheet often helps with synthesis.

4. The exam will cover all material discussed in class, recommended readings, assignments, and projects done through this point in the course.

**Mechanics**

You will take this exam in class and have the opportunity to retake it outside of class.  During the in-class time, writing instruments and a basic scientific calculator are the only resources you may use.  During the outside-of-class time, you may also use the text and supplementary materials, class notes, Moodle resources, and CoCalc/SageMath.  From the outside-of-class time, you may submit solutions to any number of exercises.  These are due 9:00 AM, Wednesday, October 19 in SC 117 or uploaded as a pdf in Moodle.  If an outside-of-class solution is submitted for an exercise, then its grade will be averaged with the in-class grade.  Each exercise is worth 10 points.