

## REVIEW SHEET FOR TEST 2

The best way to prepare for a test is to review homework problems, examples from the textbook and class notes. Make sure that you can solve these problems in a reasonable amount of time without reference to the textbook or class notes. It is important that on the test you show all your work and explain your answers. Just answers (especially wrong ones!) without any explanation will earn you no credit.

### List of major topics covered in class.

1. Know at least one example of an initial value problem with more than one solution, and an example of an initial value problem with a solution that blows up (see class notes or examples in Sec. 1.5). Know statements of existence and uniqueness theorems (see class notes). Review problems: 3, 5, 9, 12, 13, 14 on pp. 71-73.
2. Equilibrium points and their classification. Phase line. Review problems: #3, 5, 8, 15, 17, 31, 33, 37 on pp. 89-91.
3. Predator-Prey model: equilibrium solutions, initial conditions, solution curves, phase portrait (pp. 12-14 and 150-156), vector field, and direction field (pp. 167-168), modified predator-prey model (pp. 155-156), competing species (pp. 175-177). Review problems: 21, 22, 23 on pp. 20-21, and also 1, 2, 3, 5, 6, 7, 9, 10, 16 after section 2.1.
4. Simple harmonic oscillator model: equation of, reduction to a first order system, initial value problem, solution curves (pp.156-160), vector field, and direction field for harmonic oscillators (pp. 168-170). Review problems: 19, 20, 22 on pp. 164-165.
5. Geometry of systems: vector notation, vector field, direction field, solution curves, equilibrium points and how to find them, equilibrium solutions (pp. 166-178). Review problems: 2, 3, 6, 8, 9, 11, 13-18, 21, 23 on pp. 178-182.
6. Damped harmonic oscillator: equation of, guess and test method, solutions in vector notation, solution curves (pp. 183-187). Review problems: 1, 3, 5 on pp. 187-188.
7. Analytic methods: checking solutions (pp.189-190), solving completely and partially decoupled systems (pp. 191-194), plotting solutions and solution curves, examples in Sec. 2.3. Review problems: 1, 3, 4, 7, 8, 9, 10, 13 on pp. 194-195.
8. Linear systems: matrix notation (pp. 243 -246). Linearity principle (pp. 249-255). Applications of Linearity principle to solving initial value problems (pp. 252-255). Linear independence and general solution (pp. 255-256). Undamped harmonic oscillator (pp. 256 -258). #5, 9, 11, 16, 17, 24, 25, 27 after section 3.1.

**Good Luck!**