Summer 2007   Math 331:   Week 3

Section 1.3   Qualitative Technique: Slope Fields

Key concepts:

- Sketching slope fields
- Special cases $y' = f(t)$ and $y' = f(y)$
- (Skip RC Circuits)

Section 1.3, Exercises 1 - 10, 12 - 18 (the numbering is the same in the 2nd ed.)

Section 1.4   Numerical Technique: Euler's Method

Key concepts:

- Euler's method for approximating the solution of the initial value problem $y' = f(t, y)$, $y(t_0) = y_0$ is defined recursively as $t_{k+1} = t_k + \Delta t,$ $y_{k+1} = y_k + f(t_k, y_k)\Delta t,$ $k = 0, 1, 2, \dots$

Section 1.4, Exercises 1 - 9 (the numbering is the same in the 2nd ed.)

Section 1.5   Existence and Uniqueness of Solutions

Key concepts:

- Existence and uniqueness theorem
- Lack of uniqueness; the relation to the existence and uniqueness theorem

Section 1.5, Exercises 2, 6, 7, 9, 10, 12 (the numbering is the same in the 2nd ed.)

Section 1.6   Equilibria and the Phase Line

Key concepts:

- How to draw a phase line
- Not all solutions exist for all time
- Classification of equilibrium points: Sink, Source, Node
- Linearization theorem

Section 1.6, Exercises 2, 3, 4, 8, 9, 12, 13, 17, 18, 22, 23, 25, 28, 37, 40, 41, 42 (2nd ed. 2, 3, 4, 8, 9, 12, 13, 17, 18, 22, 23, 25, 28, 38, 39, 40; note that in the 2nd ed. exercise 37 is missing)

Section 1.7   Bifurcations

Key concepts:

- Equations with a parameter
- The bifurcation diagram
- Determining bifurcation values

Section 1.7   Exercises 1 - 10, 15, 16, 17