Differential Equations Homework Assignments

These assignments are from our textbook, organized by topic.

Chapter 1

- Section 1.1
  (a) Equilibrium solutions: # 2, 4
  (b) Decay model: # 6, 7a, 8ab
  (c) More complex models (after logistic): # 12, 14, 15
  (d) Relative growth: # 20
  (e) Predator-prey: # 21, 22
- Section 1.2
  (a) Checking Solutions: # 2
  (b) Solving separable DEs: # 8, 16, 17
  (c) Solving separable IVPs: # 30, 35, 38
  (d) Applications: #40, 43
- Section 1.3

  For all exercises in this section, when the book asks you to use HPGSolver, instead use the free online software `dfield` at `http://math.rice.edu/~dfield/dfpp.html`. There is a link to page this from our course webpage.
  (a) Using `dfield`: # 3, 6, 8, 9
  (b) Implications: #12, 14, 15,
  (c) Application: # 19
- Section 1.4
  (a) Euler's method with spreadsheet or by hand: # 3, 7
  (b) This problem will let you see how close your Euler's method estimation is to the true solution of an IVP.
    1. Find, or recreate, your solution to Section 1.2 # 35
    2. Use this solution to find the value of $y(3)$
    3. Now use Euler's method to estimate the value of $y(3)$, using some step size that you choose. How close is this estimate?

  (c) Skydiver: # 12
- Section 1.5
  (a) Applications of Uniqueness: # 1, 3, 5, 7
- Section 1.6
  (a) Sketch phase line: #5, 8
  (b) Sketch graphs: #17, 20
  (c) $f(y)$ and phase line: # 32, 36
  (d) Matching: # 37
- Section 1.8
  (a) Undetermined coefficients: # 4, 12, 20, 21

Chapter 2

- Section 2.1
  (a) Understanding predator-prey model: # 1, 2, 15, 17
  (b) Qualitative solution to P-P: # 7, 16 (use `Berkeley Madonna` instead of `HPGSystemSolver`)
  (c) Modifications to P-P: # 9, 10, 14
  (d) Springs: #19, 20, 22

  _____ Exam 1 Covers To Here _____

- Section 2.2 (use `pplane` at `http://math.rice.edu/~dfield/dfpp.html` instead of `HPGSystemSolver`)
  (a) Understanding direction field: # 2, 4
  (b) Converting second order: # 7
  (c) Qualitative: # 9, 14, 27
  (d) Finding Equilibrium Solutions: #12
  (e) Matching: # 11, 21
- Section 2.3
  (a) Guess and check: # 2, 6
  (b) # 8
  (c) Modifying damped harmonic oscillator model # 9, 10

Chapter 3

- Section 3.1
  (a) Matrix form: # 5, 9, 12
  (b) Theoretical: # 15, 17,
  (c) House sale model: # 20, 21
  (d) Show functions are solutions # 24, 26, 29
- Section 3.2
  (a) Solving: # 3, 6, 12, 14, 20, 21
- Section 3.3
  (a) Sketching Phase Plane # 1, 7, 9, 13, 19
  (b) Applications: #17, 21, 22
- Section 3.4
  (a) Solve and sketch: # 2, 4, 6, 10, 12
  (b) Qualitative: # 15
  (c) Theoretical: # 20, 23
- Section 3.5
  (a) Repeated: # 1, 3, 5, 7
  (b) Theoretical: # 12, 16 (hard)
  (c) Zero Eigenvalue: #17, 19, 20
- Section 3.6
  (a) solving second order DE by guessing: # 3, 5, 9
  (b) 2 ways to solve: # 15, 17, 23, 25
  (c) Theoretical: # 31, 38

- Section 3.7
  (a) # 1
  (b) Curve in TD plane: # 3, 4

Chapter 5

- Section 5.1
  (a) #1, 3, 4, 7, 17

Chapter 4

- Section 4.1
  (a) # 1, 5, 13, 25, 33

——— Last Homework Assignment! ———

- Section 4.2
  (a) # 5, 9, 13, 17
- Section 4.3
  (a) # 21

Chapter 6

- Section 6.1
  (a) # 3, 11, 13, 15, 17, 23