HOMEWORK ASSIGNMENTS

All assignments are from the required text by Farlow, Hall, McDill and West. Answers to all problems must be justified—unexplained numerical answers will get no credit. Calculations must be done by hand unless you are given specific instructions to do otherwise.

Week 1: Due Tuesday, Jan. 27:
Sec. 3.2, pp.143–145: 5,6,8, 12,13,14,16,19, 21,22, 30, 32, 33, 36, 73
Use the row operation notation on p.134 of the text to explain each step of row-reduction needed to solve 12,13,14,16,19,21,22. In the case of more than one solution, follow the pattern set in Example 7 on pp. 139–140 of the text. In 30,32,33,36 we give you a pass to use \texttt{rref} but otherwise do not stint on explanation.

Week 2: Due Tuesday, Feb. 3:
Sec. 3.1, pp. 127–130: 4,6,10,14,18,22,54,56
Sec. 3.2, pp.143–145:1,2,4, 66 (To do 66 you may use your calculator to calculate \texttt{rref} but then you must write out the solution in the format of Example 7 on pp. 139–140.)
Sec. 3.4, pp. 164–167: 3,4,6,7,13,17,19,41,42 (When/if using row operations, use the notation from p.134 of the text.)
Sec. 2.2, pp. 70–73: 1,2,6,8,16,18 (We use only the integrating factor method to solve first order linear differential equations in this course. This is just review from Math 1372.)

Week 3: Due Tuesday, Feb. 10:
Sec. 3.3, pp.154–156: 1,2,6,8,10,13,20, 23 (In prob. 23 you may find the inverse with your calculator but otherwise have to supply the details.)
Sec. 3.3: 15 is not assigned but you must know it!
Sec. 1.1, pp. 9–11: 1,2,3 (This section introduces many types of differential equations we will later be studying in detail and introduces vocabulary we will use a lot.)
Sec. 1.2, pp. 20–24: 2,3, 13,14, 16—21,
Sec. 1.3, pp. 29–32:11,12,19,25–30, 31,32,34, 57

(next page, please)
Week 4: Due Tuesday, Feb. 17:
Sec. 3.4, pp. 164–167: 46, 50 (The method of 50 also makes quick work of 46.)
Sec. 2.2, pp. 70–73: 22,23,29,30
Sec. 2.3, pp. 77–80: 4,5,6,8,17,22,28
Sec. 2.4, pp. 84–87: 2,4,6,16,18
Your answers to the questions in Secs. 2.3 and 2.4 will require a few words (or pictures) of explanation over and above the calculations.

Week 5: Due Tuesday, Feb. 24:
Sec. 4.1, pp. 205–210: 1,2,3,4,23,24,25,26,40,41,42,43,47

Week 6: Due Tuesday, Mar.3:
Sec. 4.2, pp. 222–229: 2,6,11,14,18,19,20,21,56,61,62
Sec. 4.3, pp. 238–243: 1,2,3,4,11,12,15,16,64,65

Week 7: Due Tuesday, Mar. 10:
Sec. 4.4, pp. 253–254: 6,7,8,9,10,12,14,16,32,41,46,49
Sec. 5.3, pp. 324–326: 2,3,4,6,8,11,12,14,15,20,22,23,28
The instruction to find the dimension of the eigenspace of $A$ for the eigenvalue $\lambda$ means: say how many nonpivot columns appear in the reduced row-echelon form of the matrix $A - \lambda I$ or, equivalently, the least number of parameters you need to represent all the solutions of the system of equations $Ax = \lambda x$.

BTW, just to mention this, because it is not mentioned in the main part of the text: the product of the eigenvalues equals the determinant. (Problem 50 from Sec. 5.4 of the text does mention this fact.)

Week 8: Due Tuesday, Mar. 24
Sec. 1.4, pp. 43–45: 2
Sec. 4.6, pp. 270–273: 2,3,6,12,13,15,21,22,34
Sec. 5.4, pp. 327–339: 27,28,29,34,35,38,41
Homemade problems: Find the matrix powers $A^n$ of the following matrices $A$:
\[
\begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix}, \quad \begin{pmatrix} 0 & 2 \\ 1 & 1 \end{pmatrix}
\]

Week 9: Due Tuesday, Mar. 31
• §3.6, pp. 191–194:9,11,15,16
• “Home-made” problems related to §4.7: Convert each IVP below to an IVP for a system of linear first order differential equations, as explained in class.
HM1: $y'' + 2y' + 5y = 7\cos(t), y(0) = -3, y'(0) = 1$
HM2: $y'' + 4y' + 4y = 3t e^{-2t}, y(0) = 5, y'(0) = 2$
HM3: $y'' + 3y' + 2y = t^2 + 1, y(0) = 2, y'(0) = -4$
HM4: $2y'' + 10y' + 12y = 4t \sin(3t), y(0) = 1, y'(0) = -2$
• §6.2, pp. 369–372: 9,10,13,26,27,29,30
• §6.3, pp. 381–385: 1,3,5,6,9,13,15,16 (In the problems in Sections 6.2 and 6.3, do not worry too much about sketching the solution, although you are encouraged to think about this.)

Week 10: Due Tuesday, Apr. 7
• §8.1, pp. 474–475: 2,3,8,14,15,18,41,42,48,52
• §6.7, pp. 418–419: 4,5,6,13
• Rather than follow the instructions in the textbook, solve problem 13 of §6.7 by again using the method of undetermined coefficients.

**Week 11: Due Tuesday, Apr. 14**

- §6.5: p. 401: 4, 5, 7, 10, 12, 15, 16, 18
- §8.2: pp. 483–484: 4, 5, 6, 7, 9, 10, 11
- §8.3: pp. 496–500: 1, 2, 3, 4, 20, 21, 22, 23, 26
- Instead of following the textbook instructions for 20, 21, 22, 23, 26 you are instructed to rewrite each of the given functions as a “function-in-pieces” and to sketch its graph.

**Week 12: Due Tuesday, Apr. 21**

- §8.3: pp. 496–500: 10, 11, 12, 13, 14, 15, 16, 17
- §8.3: 20, 21, 22, 23 (this time, follow the textbook instructions)
- §8.3: 29, 30, 31, 32 (for problem 32 also provide a graph of the inverse Laplace transform)
- §8.3: 33, 34, 35, 36, 52
- §8.5: 2, 4, 6, 7, 10
- Home-made problem: Use Laplace transforms to solve the following initial value problem:

\[
\begin{align*}
& x'' = -22x + 6y, \quad y'' = 6x - 17y, \\
& x(0) = 0, \quad y(0) = 0, \quad x'(0) = 1, \quad y'(0) = -2.
\end{align*}
\]

**Week 13: Due Tuesday, Apr. 28**

- §8.4: 5, 6, 10, 13, 14, 19, 20, 22, 23, 25
- §9.1: 13(a,c), 26, 37(a,b), 38, 44
- Note: §9.1 is not covered on MT3 but it will be fair game for the final exam.

**Week 14:**

No homework this week, but you are encouraged to work on the problems in week14problems.pdf.