Assignments are finalized for a given week by 5pm on Mondays.
All exercises come from the text by Edwards-Penney-Calvis unless explicitly
marked “home-made” and written out in this document.
Only the beginning page of a sequence of exercises is given.

Week 1, Jan 16–19 [hmwk due Jan 23].

- Sections covered:
  - Wed: 3.1: systems of linear equations, “three possibilities,” method of
    elimination,
  - Fri: 3.2: coefficient matrices, augmented matrices, Gaussian elimina-
    tion, row operations and notation for them, echelon form

- Homework assignment:
  - 3.1, p. 145: 3,5,7,9,11,15,19,23 (Each of the “three possibilities” appear
    in this list of homework problems. As part of your final answer to each
    problem say in a word or two which of the three cases holds.)
  - 3.1 (continued): 23 (Ignore the diff. eq. and just find the constants.)
  - 3.2, p. 154: 1,3,8 (Use vector notation for final answers as shown in
    class—this is much easier for us to read and you may be asked to use
    this notation on tests.)
  - 3.2 (continued): 13,15,20, 21 (Use the row operation notation on p. 149
    to explain each step—you may be asked to use this notation on tests.
    Also report final answers in vector notation.)

- Remark: Practicing on more of the linear system problems than just the
  assigned ones is a good idea. Checking your answers with your calculator or
  Wolfram Alpha or some equivalent tool is easy and encouraged. Of course
  we want to see the steps on your homework, not just the final answer. The
  steps are what you get credit for and get tested on.
Week 2, Jan 22–26 \[\text{hmwk due Jan 30}\]

- Sections covered:
  - Mon: 3.3: \texttt{rref} and also 1.4: separable diff. eqs.
  - Note added Jan. 22: For background on and vocabulary for differential equations also see section 1.1.
  - Wed: 3.4: Matrix operations and 1.4: population growth etc.
  - Fri: 3.5: Matrix inverse, \(x = A^{-1}b\) and 1.4: heating and cooling

- Homework assignment:
  - 1.4, p. 41: 6,17,19,23 (solve separable DEs)
  - 1.4: Home-made: Solve \(\frac{dy}{dt} = y(4 - y), y(0) = 3\).
  - 1.4, p. 41: 34,35,38 (population growth)
  - 1.4, p. 41: 43,49,65 (heating/cooling)
  - 3.3, p. 162: 4,12,13,19
  - Each row operation must be labeled using notation on p. 149 of the text.
  - 3.4, p. 173: 3,8,9,13,15
  - 3.5, p. 185: 6,7
  - 3.5, p. 185: 16,17,19 (Again, label row operations.)
  - As per usual, more practice on similar unassigned problems is good.
  - You are expected to calculate by hand on this assignment.

Week 3 (Jan 29–Feb 2) \[\text{hmwk due Feb 6}\]

- Sections covered:
  - Mon: 3.6(determinants: introduction; Cramer’s Rule), 1.5(first order linear DEs: introduction; integrating factor method)
  - Wed: 1.5 (mixture problems), 3.6(vocabulary, properties of determinants, computations)
  - Fri: 1.5 (more mixture problems), 3.6(transpose, adjoint formula for inverse)

- Homework assignment
  - 1.5, p. 53: 2,3,6,13,14,17,33,36,37,41
  - 3.6, p. 201: 2,3,6,7,9,12,15,20,21,22,23,31,33,35

Week 4 (Feb 5–9) \[\text{hmwk due Feb 13}\]

- Sections covered:
  - Mon: 4.1
  - Wed: 4.2, 5.1
  - Fri: 5.1,5.2

- Homework assignment:
  - 4.1, p. 220: 2,3,6,7,11,12,15,18,19,20,25,28
  - 4.2, p. 227: 15,16,20
  - 5.1, p. 276: 2,3,6,7,9,12,34,35,36,39
  - 5.2, p. 288: 2,4,23,24
  - Whether a problem is odd or even, you have to show all the steps. The steps are what you get credit for. Linear algebra problems have to be solved by hand until after the first midterm.
Week 5 (Feb 12–16) [hmwk due Feb 20]

• Midterm I: Friday, February 16, 2018
  • Sections (selectively) covered:
    – Mon: 5.3, 5.4: IVPs for homogeneous 2nd order linear DEs with constant coeffs.; free undamped motion; mass-spring-dashpot systems;
    – Wed: 5.3, 5.5: free damped motion; intro to “undetermined coefficients”; free fall with air resistance
  • Homework assignment:
    – 5.3, p. 300: 21,22,23
    – 5.4, p. 311: 2,4,14(ignore the “show that...” instruction),18(ignores the “construct a figure...” instruction),22
    – 5.5, p. 325: 1,2,3,31,32,33
    – Home-made: Solve the initial value problem
      \[ y'' + 0.2y' = -32, \quad y(0) = 10000, \quad y'(0) = 0. \]
      Use the method of undetermined coefficients. Evaluate \( y \) at the time when \( y' \) is 90% of its limiting value as \( t \to +\infty \).

Week 6 (Feb. 19–23) [hmwk. due Feb. 27]

• Sections covered:
  – Mon: Selective coverage of 4.4 plus “side-by-side” method (see example on web page). Further coverage of 5.3 and 5.5.
  – Wed: Further coverage of 5.3 and 5.5, with supporting coverage of complex numbers and Euler formula. Undetermined coefficients at “black belt” level. Further coverage of 4.4: formal definition of a basis, and methods for finding such. Quick intro. to 5.6
  – Fri: Continue 5.6 including practical resonance. Roots, powers, and logarithms of complex numbers (some material not in text).
• Homework assignment:
  – Home-made (practice with complex numbers). Find the square roots and cube roots of \( 3 - 4i \). Express final answers in \( a + bi \) form accurate to 4 places after the decimal. (Your calculator can do this but you have to explain your answer in terms of Euler’s formula and the laws of exponents.)
    – 4.4, p. 241: 7,8,9,10,11 (Just use the algorithm on p. 240 to produce a basis, i.e., color inside the lines.)
    – 4.4, p. 241: 21,26 (Follow p. 240 to get an answer, but also use the “side-by-side” method to get another answer, and reconcile the two answers. See note on the web page posted Feb. 19, 2018 for some guidance.)
    – 5.3, p. 300: 11,24,27,39,40,41,42
    – 5.3, p. 300: 43 is NOT assigned but you must know what 43(a) says.
    – 5.5, p. 325: 17,21,23,26,34
    – 5.6, p. 335: 7,9,17
• From now on (with few exceptions) you will not have to do row operations by hand. You can use the \texttt{rref} button under the “full disclosure” rule. You will have many systems of linear equations to solve in your study of differential equations. Get good at using \texttt{rref}. 
Week 7 (Feb 26–Mar 2) [hmwk. due Mar 6]

- Sections covered:
  - Mon: 7.1: intro to systems of first order differential equations, conversion to first order systems; 6.1: intro to eigenvalues and eigenvectors
  - Wed: 7.2: linear systems of first order differential equations; Wronskians; 7.3: intro to eigenvalue method; 6.1: continuation as needed
  - Fri: 7.3: continuation; cascading brine tanks; 6.1: continuation as needed
- Only real eigenvalues are considered this week.

- Homework assignment:
  - 6.1, p. 346: 1,5,9,12,15,17,22
  - 7.1, p. 371: 1,3,6,9
  - 7.2, p. 384: 2,11,12,14,15,24,25
  - 7.3, p. 395: 2,3,6,7,22,23,27,28,38
  - Note added Friday, March 2, 2018: Ignore the instruction to draw direction fields and graphs with a computer in problems 2,3,6,7

Week 8 (Mar 5-9) [hmwk due Mar 20, after spring break]

- Sections covered:
  - Mon: 7.3 again: two-by-two with complex eigenvalues; 6.2: intro. to diagonalization
  - Wed: 6.2: diagonalization (continued), Cayley-Hamilton theorem
    - 6.3: application to powers of matrices; “weather in Oz”
  - Fri: 8.1: matrix exponentials, mostly the two-by-two case

- Homework assignment:
  - 6.2, p. 353: 2,3,4,10,15,16,20,23
  - 6.3, p. 363: 2,4,10,12,25,26,27,30
  - In problems 25,26, just find \( A^{-1} \) using Cayley-Hamilton.
  - 7.3, p. 395: 11,12,13,14 (ignore instruction to make graphs)
  - 8.1, p. 479: 2,3,5 (In these problems instead of finding a fundamental matrix as instructed, find the matrix exponential by the easy method discussed in class and then solve the IVP using it.)

Spring Break (Mar 12–16) yay!

Week 9 (Mar 19–23) [hmwk due Mar 27]

- Midterm II, Friday, March 23, 2018

- Sections covered:
  - Mon:
  - Wed:

- Homework assignment:
Week 10 (Mar 26–30)

- Sections covered:
  - Mon.
  - Wed.
  - Fri.
- Homework assignment:
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Week 11 (Apr 2–6)

- Sections covered:
  - Mon:
  - Wed:
  - Fri:
- Homework assignment:
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Week 12 (Apr 9–13)

- Sections covered:
  - Mon:
  - Wed:
  - Fri.:
- Homework assignment:
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Week 13 (Apr 16-20)

- LAST HMWK TO BE COLLECTED THIS SEMESTER.

- Midterm III, Friday, April 20, 2018

- Sections covered:
  - Mon:
  - Wed:
- Homework assignment:
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Week 14 (Apr 23–27).
- Homework assigned this week is suggested only, not collected.
- Sections covered:
  - Mon:
  - Wed:
  - Fri:
- Homework assignment:
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Week 15 (Apr 30–May 4) REVIEW.
- Mon: review
- Wed: review
- Fri: review

LAST DAY OF INSTRUCTION: Friday, May 4, 2018

Final exam:
Monday, May 7, 2018, noon–3pm