Office Hour Help: M & W 2:30–4:00, Tu 2:00–3:30, & F 1:30–2:30 or by appointment. Website: http://math.hws.edu/~mitchell/Math204S16/index.php.

Reading and Practice

☞ Note all future homework assignments will be posted online at our course website listed at the top of the sheet. Let's save a tree!

1. Read Section 1.3 and review Section 1.2.

2. (*a*) You should be able to define these key concepts: **pivot, pivot column, echelon form, reduced row echelon form, basic variables, free variables.**

(*b*) How can you tell from the reduced row echelon form of a system whether it has no, exactly one, or infinitely many solutions?

3. (*a*) Page 21, Practice Problems #1 and 2. The answers are on page 27.

(*b*) Page 21–22 #1, 5, 11, 13, 15. Straightforward reduction/echelon form problems. Answers in the back of the text.

(*c*) Page 22 #19. This problem is a bit harder. You will have to think about how you to get three different echelon forms in this problem.

(*d*) These problems make you think a bit. They do not involve calculations. I will put problems like these on the test. Page 22 #21, 23(note the word *coefficient*, not augmented), 25, 27, 29, and 31(Can you draw what must be happening geometrically? Remember these are linear equations in 2 variables, so what do they represent?)

Row Reduction Questions For Discussion Class Today and Next Time

1. How do you know when you are done with reduction?

2. If you use different row operations in reducing an augmented matrix, do you get a different answer?

3. Can a **nonzero row** (or column) in a matrix have any zeros as entries?

4. True or false: A **leading entry** in a nonzero row is the rightmost nonzero entry in the row.

5. True or false: If a matrix is in echelon form each pivot is always a 1.

6. True or false: Suppose the last row of an augmented matrix in echelon form is $[0\ 0\ 0\ 0\ 0\ 1]$. Then the system is consistent.

7. True or false: If there is a free variable in the RREF of an augmented matrix, then the system must have an infinite number of solutions. (Why is the answer false?)

8. For each of the following, decide whether or not it is possible for a system to satisfy the given description. If it is possible, give an augmented matrix (in row-echelon or reduced row-echelon form) that corresponds to such a system and **prove** that the corresponding system does in fact fulfill the requirements. If it is not possible, **prove** that it is not possible.

(*a*) A system of 4 equations in 2 unknowns that has no solutions.

(*b*) A system of 2 equations in 3 unknowns that has exactly 1 solution (unique).

(*c*) A system of 3 equations in 3 unknowns that has infinitely many solutions.

Individual Hand In

The problems below are straightforward, they should not take long.

1. Section 1.2, Exercises 3 and 4. Reduce each matrix first to row echelon form. You may zero out an entire column at each step without re-copying the matrix, but should list each elementary row operation you perform. (Make sure they ARE elementary row operations.) Then go from row echelon form to reduced row echelon form. Again, you may zero out an entire column without re-copying the matrix. Circle the pivot positions in the final matrix and in the original matrix, and list the pivot columns.

2. Section 1.2, Exercises 12 and 14. Be sure to show your work or reasoning.

Group Hand In: Using Maple to Solve Systems of Equations

Work with one to three partners. Hand in a single copy (make sure all have a copy). The goal of this assignment is familiarize you with using `Maple` to easily solve larger, useful systems of linear equations. Review `MaplePrimer1` (and also `MaplePrimer2` online at our website) as needed. Use the *ReducedRowEchelonForm(A)* command.

REMEMBER: Put the entire document in 9 or 10 point font to save paper. You can do this by by using 'Select All' under the Edit menu and then clicking on the font size button at the top.

1. On page 23 of the text, read the paragraph preceding Exercise 33. It discusses interpolating polynomials. Given a number of data points, you want to find a polynomial whose graph would pass through all those points.

(*a*) Look at Exercise 33. We want to find a degree 2 polynomial $p(t) = a_0 + a_1t + a_2t^2$ that goes through the three given points. For the polynomial to pass through the second point listed, $(2, 15)$, means that $p(2) = a_0 + a_1 2 + a_2(2)^2 = a_0 + 2a_1 + 4a_2 = 15$. This gives us one of the linear equations listed. The others are similar. Note that the variables in these equations are a_0, a_1, and a_2 instead of x_1, x_2, etc. In `Maple`, create the augmented matrix corresponding to this system. Remember that you can input entries as powers: 3^2. Then use `Maple` to find the solution to the system. What is the interpolating polynomial? (Type this in as text in your worksheet.)

(*b*) Plot your graph using the `plot( )` function. Example: `plot(cos(t)+sin(t),t=0..`π`)` plots $\cos(t) + \sin(t)$ on the interval $[0, \pi]$. Does your interpolating polynomial go through the correct points?

2. More Realistic. Do Exercise 34. The idea is the same. This time the velocities are the inputs (the t-values) and the force is the prescribed value of $p(t)$ which is now a degree 5 polynomial. There will be 6 equations in 6 unknowns.

(*a*) Create the augmented matrix. Remember that you can input entries as powers: e.g., 8^5. Also: Use fractions instead of decimals to get an exact answer, e.g., $\frac{29}{10}$ instead of 2.9.

(*b*) Determine the interpolating polynomial and graph it.

(*c*) Using your polynomial to estimate the force when the projectile is traveling at 750 ft per second. P.S.: Watch the units, how will 750 ft per second be represented?) You should be able to do this by clicking on the plot and using the point probe tool. See `http://www.maplesoft.com/support/help/maple/view.aspx?path=worksheet%2Fplotinterface%2Fpointprobe`