EXAM PREP INFORMATION AND REMINDERS

Your first Exam Prep Assessment will take place during your recitation on Tuesday, January 30th. Here is some information and reminders:

1. Each exam prep will contain two sections:
   - **Section A** includes computational problems (similar in style to your Webwork assignments). You do not need to show work for your answers in Section A, and no partial credit will be given in this section. This section is meant to test your capacity for careful computational work.
   - **Section B** includes conceptual and proof-based problems (similar in style to your Problem Sets). You must show work and provide justification for your answers in Section B. This section is meant to test your conceptual understanding of course material and capacity to put together a sound mathematical argument.
2. Each exam prep will be written to take about 30 minutes, but you will be given the full 50 minute period to complete it.
3. You are allowed to have a full page of notes (front and back) for every exam prep. No other notes or calculators are allowed.
4. I will drop your lowest two exam prep scores
5. Your exam prep will be scanned and graded on Gradescope, generally by Monday the week following the assessment. You will have one week from the date grades are released to submit regrade requests.

The following page contains a practice exam prep. **You do not need to turn in this assignment**. Solutions will be posted on the course website by Friday this week. Note that I typically will not provide practice exam preps. For future exam preps, I expect you to study using the material from the course (problem sets, worksheets, lecture notes, etc).

Name: _____

Andrew ID: _____

GENERAL INSTRUCTIONS:

- This exam prep contains two sections: Section A includes computational problems, and Section B includes conceptual and proof-based problems. Please read the instructions at the beginning of each section carefully.
- You are allowed a full page of notes (front and back).
- No calculators or any other electronics are permitted.
- Write your answers clearly and make sure your handwriting is legible. If we cannot read your work, we will not grade the problem.
- All work must be completed in the space provided. If you need scratch paper, there is some at the front of the class. Please note that scratch work will not be graded.
- Please ask questions if anything is unclear.
- If you finish early, check all of your work, then bring this packet up to the front of the class.
- Good luck!

Section A.

INSTRUCTIONS:

1. Each problem in this section is worth **one point** and no partial credit will be given.
2. You do not need to show your work or provide justification on any problem in Section A.
3. Make sure to **clearly box or circle your answer**.

A.1. Convert the following situation into a system of linear equations. **Do not solve the system!**. A furniture company makes chairs, coffee tables, and desks. Each chair requires 10 minutes of sanding, 6 minutes of staining, and 12 minutes of varnishing. Each table requires 12 minutes of sanding, 8 minutes of staining, and 12 minutes of varnishing. Finally, each desk requires 15 minutes of sanding, 12 minutes of staining, and 18 minutes of varnishing. Each week, the sanding bench is available for 16 hours, the staining bench for 11 hours, and the varnishing bench for 18 hours. How many of each piece of furniture should be made each week so that the benches are fully utilized? **You do not need to provide a justification for your answer, but make sure to clearly label your variables.**

A2. Find all solutions to the following system of linear equations

$$x + y + z = 2$$

$$x - y + z = 1$$

$$x - y - z = 0$$

A3. Find all solutions to the system of linear equations with the following augmented matrix

$$\left(\begin{array}{cccc|c} 2 & 3 & -1 & 1 & 1 \\ 1 & 1 & 0 & 0 & 2 \\ -1 & 0 & -1 & 1 & 0 \\ 1 & 1 & 0 & 0 & 4 \end{array}\right)$$

Section B.

Instructions:

1. Each problem in this section is worth **5 points**.
2. You must provide justification for all of your answers in Section B.
3. Points will be awarded based on the rubric below. Note that half points may be awarded, and further rubric items may be added to cover potential cases not outlined below.

Points	**Rubric**
5	Solution is presented with clear justification that is logically complete and correct. May include minor typos and computational errors if they do not majorly impact the argument. No important steps are missing or assumed. All assumptions and special cases have been covered. All suggestions for improvement come under the category of "improvements for clarity" rather than "correcting logical errors". Omission of details will be judged depending on context of the material, with simpler steps being acceptable for omission when covering more advanced topics.
4	Solution is close to full and complete, but contains either a computational error or an error in reasoning that majorly impacts the argument. This score is also appropriate for solutions that are mathematically sound but confusingly written.
3	Solution is incorrect, but understanding of the problem was demonstrated and student provided a clear outline of a potential approach with information about where they got stuck **-or-** solution is correct but justification is insufficient or so confusingly written that it cannot be followed with a reasonable amount of effort.
2	Solution is incorrect, but student demonstrated understanding of the problem **-or-** solution is correct and student did not provide justification for their answer.
1	Solution is incorrect and student did not demonstrate understanding of the problem, but did demonstrate some knowledge of relevant material.
0	Solution is incorrect or incomplete, and there was no demonstration of knowledge of relevant material.

B.1. Recall that a linear equation in two variables defines a line in $\mathbb{R}^2$. Suppose that you have a system of three linear equations in two variables where all three of the corresponding lines are distinct. **Using only geometric reasoning**, explain why this system cannot have infinitely many solutions.

B.2. Determine whether the following statement is true or false: if a linear system has fewer equations than variables, it must have an infinite number of solutions. **If true, provide a proof. If false, provide a counterexample and justify why this is a counterexample.**

B.3. A system of linear equations is called HOMOGENEOUS if the constant term in each equation is zero. For example

$$2x + y = 0$$

$$3x - y = 0$$

is a homogeneous system of linear equations. Is it possible for a homogeneous system of linear equations to have no solutions? If so, provide an example. If not, provide justification for why not.