Name: Answers

Instructions: This is a closed book quiz, no notes or calculators allowed. Please check your answers carefully; I will only award limited partial credit.

1. (2 points) Just answer "yes" or "no"; you do not need to explain why your answer is correct.
   (a) Is the equation $|x| + 4y^2 = 12$ linear?

   Solution: No. Absolute value signs and squares of variables are not allowed in linear equations.

   (b) Is the equation $e^3 x - \sqrt{\pi}\, y = \ln(\sqrt[5]{98})$ linear?

   Solution: Yes. This is of the form (constant)x + (constant)y = (constant), which is a linear equation.

2. (3 points) What is the augmented matrix for the following system?

$$\begin{aligned} x_1 - x_2 + x_3 &= 1 \\ 2x_1 - 2x_2 + 3x_3 &= 3 \end{aligned}$$

Solution:

$$\begin{bmatrix} 1 & -1 & 1 & 1 \\ 2 & -2 & 3 & 3 \end{bmatrix}$$

3. (5 points) Transform the augmented matrix from problem 2 to reduced echelon form, and use the result to solve the original system. Use the back of the page if you run out of room.

Solution: Replace R_2 (row 2) by $R_2 - 2R_1$, to make the first entry zero:

$$\begin{bmatrix} 1 & -1 & 1 & 1 \\ 2 & -2 & 3 & 3 \end{bmatrix} \xrightarrow{R_2 - 2R_1} \begin{bmatrix} 1 & -1 & 1 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix}$$

Then replace R_1 by $R_1 - R_2$:

$$\xrightarrow{R_1 - R_2} \begin{bmatrix} 1 & -1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}$$

Now translate this back to equations:

$$\begin{aligned} x_1 - x_2 &= 0 \\ x_3 &= 1 \end{aligned}$$

So the solution is: $x_1 = x_2$ and $x_3 = 1$. (x_2 is an independent variable.)