Printed: September 20, 2019 Name _____

Take-home MATH 6012 Quiz1-2019$_A$ due Fri, Sept 6 at 2:31PM **Answer: Key**

Be sure to show your work.

1. Set up and solve (using software, if you wish) the system of equations to solve the the following problem:

   "There are three classes of grain, of which three bundles of the first class, two of the second, and one of the third make 39 measures. Two of the first, three of the second, and one of the third make 34 measures. And one of the first,two of the second, and three of the third make 26 measures. How many measures of grain are contained in one bundle of each class?"

   –*Jiuzhang Suanshu*, a Chinese manuscript from about 200 BC

   Answer: The system is

   $$\begin{aligned} 3x + 2y + z &= 39 \\ 2x + 3y + z &= 34 \\ x + 2y + 3z &= 26 \end{aligned}$$

   http://www.bluebit.gr/matrix-calculator/ gives

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   Solution A*X=B
   9.250 4.250 2.750
   ```

2. Use Gaussian elimination (by hand!!!) to write the solution of the system

   $$\begin{aligned} x + 5z &= 2 \\ -2x + y - 6z &= -1 \\ 2y + 8z &= 6 \end{aligned}$$

   in vector form.

   Answer: We row-reduce the augmented matrix

   $$\begin{bmatrix} 1 & 0 & 5 & 2 \\ -2 & 1 & -6 & -1 \\ 0 & 2 & 8 & 6 \end{bmatrix} \mapsto \begin{bmatrix} 1 & 0 & 5 & 2 \\ 0 & 1 & 4 & 3 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

   The equivalent system has infinitely many solutions,

   $$x = 2 - 5z, \quad y = 3 - 4z, \quad z \in \mathbb{R} \text{ is free}$$

   In vector form, the answer is

   $$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 3 \\ 0 \end{bmatrix} + \begin{bmatrix} -5 \\ -4 \\ 1 \end{bmatrix} s$$