Math. 362-03
Spring, 2019
R. B. Kearfott

Second Exam
Thursday, March 27, 2019

This exam is closed book. **Calculators are not allowed on this exam.** Make sure your name is on all pages. Show all work, and show it in a logical and organized manner: You will be graded on what you show, in addition to your answer. Check your work carefully. Each entire problem is worth 25 points.

1. Compute the determinants of the following matrices.

(a) $\begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 2 & 2 & 2 & 2 & 2 & 2 \\ 0 & 0 & 3 & 3 & 3 & 3 & 3 \\ 0 & 0 & 0 & 4 & 4 & 4 & 4 \\ 0 & 0 & 0 & 0 & 5 & 5 & 5 \\ 0 & 0 & 0 & 0 & 0 & 6 & 6 \\ 0 & 0 & 0 & 0 & 0 & 0 & 7 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 0 & 4 \\ 2 & 0 & 5 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 2 & 2 & 2 & 2 & 2 & 2 & 2 \\ 0 & 0 & 3 & 3 & 3 & 3 & 3 \\ 0 & 0 & 0 & 4 & 4 & 4 & 4 \\ 0 & 0 & 0 & 0 & 5 & 5 & 5 \\ 0 & 0 & 0 & 0 & 0 & 6 & 6 \\ 0 & 0 & 0 & 0 & 0 & 0 & 7 \end{bmatrix}$

2. If $\mathbf{a} = (1, -1, 1, -1)$ and $\mathbf{u} = (2, 1, 2, 1)$, find the projection of $\mathbf{u}$ onto $\mathbf{a}$, that is, find $\text{proj}_{\mathbf{a}}\mathbf{u}$.

3. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$, find a vector equation for the line representing the solution set to $Ax = 0$.

4. Write down a single linear equation in (x, y, z) for the plane containing the points $(1, 0, 0)$, $(-1, 0, 0)$, and $(1, 1, 1)$.