Math 308B **Midterm 2** **Spring 2017**

Your Name

Your Signature

Student ID #

Section (Tues.)	8:30	9:30	10:30
(circle one)	BA	BB	BC

- Turn off all cell phones, pagers, radios, mp3 players, and other similar devices.
- This exam is closed book. You may use one $8.5'' \times 11''$ sheet of handwritten notes (both sides OK). Do not share notes. No photocopied materials are allowed.
- Graphing calculators are not allowed.
- In order to receive credit, you must **show all of your work**. If you do not indicate the way in which you solved a problem, you may get little or no credit for it, even if your answer is correct.
- Place [a box around your answer] to each question.
- If you need more room, use the backs of the pages and indicate that you have done so.
- Raise your hand if you have a question.
- This exam has 4 pages, plus this cover sheet. Please make sure that your exam is complete.

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
Total	50	

1. (10 points) Let $B = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 2 & -1 & 0 & 0 \\ -3 & 3 & 1 & 0 \\ 1 & 2 & -5 & -2 \end{bmatrix}$.

   Calculate the inverse of B, or explain why it does not exist.

2. (10 total points) Determine whether each of the following is a subspace of $\mathbb{R}^4$. Justify your answer.

   (a) (5 points) The set V of vectors of the form $\begin{bmatrix} a \\ b \\ c \\ d \end{bmatrix}$, where $a+b+c=0$ and $b+c+d=0$.

   (b) (5 points) The set W of vectors of the form $\begin{bmatrix} a \\ b \\ c \\ d \end{bmatrix}$, where $a^2+b^2+c^2+d^2=0$.

3. (10 points) Let $A = \begin{bmatrix} -3 & -6 & 6 \\ 3 & 6 & -3 \\ 0 & 0 & 3 \end{bmatrix}$.

   Find the eigenvalues of A. Then find bases for the corresponding eigenspaces of the matrix.

4. (10 points) Find a linear transformation $T : \mathbb{R}^4 \to \mathbb{R}^3$ with kernel $\{\mathbf{0}\}$, or explain why such a linear transformation cannont exist.

5. (10 points) Find matrices A and B such that $\text{rank}(AB) > \text{rank}(A)$, or explain why such matrices cannot exist.