Name:______________________________

M511: Linear Algebra (Fall 2017)
Instructor: Justin Ryan
Chapter 2 Exam

Read and follow all instructions. You may not use any notes or electronic devices. You may use a compass, straightedge, and colored pens/pencils.

Part I: True/False [4 points each]
Neatly write **T** *on the line if the statement is always true, and* **F** *otherwise [2 points]. In the space provided, give sufficient explanation of your answer [2 points].*

_______**1.** $\det(A+B) = \det(A) + \det(B)$.

_______**2.** $\det(A^T) = \det(A)$.

_______**3.** If $A \in \mathbb{R}^{n\times n}$ is a triangular matrix, then $\det(A) \neq 0$.

_______**4.** If $A \in \mathbb{R}^{n\times n}$ is nonsingular, then $\operatorname{adj}(A)$ is nonsingular.

_______**5.** $(\mathbf{x} \times \mathbf{y}) = (\mathbf{y} \times \mathbf{x})$ for all $\mathbf{x}, \mathbf{y} \in \mathbb{R}^3$.

Part I: Written Problems [10 points each]
Follow all instructions exactly, and show enough work.

For questions **6 – 9** consider the matrix:

$$A = \begin{pmatrix} 2 & 3 & 5 \\ -2 & 4 & 2 \\ 1 & -1 & 3 \end{pmatrix}$$

6. Find and clearly label <u>all</u> minors of A.

7. Find and clearly label <u>all</u> cofactors of A.

Recall, for questions **6 – 9** consider the matrix:

$$A = \begin{pmatrix} 2 & 3 & 5 \\ -2 & 4 & 2 \\ 1 & -1 & 3 \end{pmatrix}$$

8. Compute $\det(A)$.

9. Compute A^{-1}, provided it exists. If it does not exist, explain why.

10. Use Cramer's Rule to solve the system of equations. Give your answer in simplified fraction form.

$$\begin{cases} 5x+7y &= 1 \\ -8x+3y &= -1 \end{cases}$$

11. Write det(A) as a simplified polynomial in x, where

$$A = \begin{pmatrix} x & 1 & 2 \\ -1 & x^2 & -3 \\ -2 & 3 & x^3 \end{pmatrix}$$

12. Find the values of λ that make A singular, where

$$A = \begin{pmatrix} 1-\lambda & \sqrt{3} \\ \sqrt{3} & -1-\lambda \end{pmatrix}.$$

13. Find the determinant of A, where

$$A = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 7 & 1 & 0 & 0 \\ \sqrt{2} & 0 & 1 & 0 \\ -3 & -\frac{1}{2} & 56 & 1 \end{pmatrix} \begin{pmatrix} 2 & 4 & -6 & 27 \\ 0 & 1 & -9 & \sqrt{3} \\ 0 & 0 & -2 & 115 \\ 0 & 0 & 0 & 5 \end{pmatrix}.$$