

Math 337 —Midterm Exam 2—Spring 2018

Provide complete explanations for your answers.

1) (20 points) Let $A = [2, 3, 4, 1]^T(1, 2, 0, 0)^T(0, 1, 1, 2)^T(1, 2, 0, 1)^T$.

a) Use the cofactor method to compute $\det(A)$.

b) Compute $\det(2A^T A^k)$ for any positive integer $k = -1, 1, 2, 3, \dots$.

2) (15 points) Use the row reduction method to compute $\det(A)$ for $A = [(2, 3, 0, 2)^T(2, 3, 1, 0)^T(0, 2, 3, 2)^T(4, 2, 2, 1)^T]$.

3) (15 points) Find an LU factorization of

$A = [(4, -16, 8)^T(-3, 12, -6)^T(-1, 2, -12)^T(5, -17, 22)^T(2, -7, 10)^T]$.

4) (15 points) Let $A = LU$ with $L = [(1, 2, -3)^T(0, 1, -1)^T(0, 0, 1)^T]$ and $U = [(2, 0, 0)(1, -1, 0)^T(3, 1, -2)^T]$.

Solve the equation $Ax = (-1, 5, 2)^T$ using ONLY the factorization $A = LU$.

5) (15 points) Find bases for $\text{Null}(A)$ and $\text{Col}(A)$

for $A = [(1, -3, 1)^T(-2, 6, -2)^T(2, 1, -4)^T(-1, 10, -7)^T]$.

6) (20 points) a) Is the set $W = \{(a, 1, 0, b)^T \mid a, b \text{ real numbers}\}$ a subspace of R^4 ?

b) Let $V = M_{n \times n}$ be the space of all n times n matrices with the usual operations $+$ and scalar multiplication.

i) If W is the subset of all symmetric matrices (i.e. $A^T = A$), is it a subspace of V ?

ii) If W is the subset of all antisymmetric matrices (i.e. $A = -A^T$), is it a subspace of V ?

iii) If W is the subset of all invertible matrices, is it a subspace of V ?