Math 1107T Cheat Sheet

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Complex Numbers

Polar Form z= rcisθ

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Modulus |z|= √ a^2 + b^2

z=a+bi

Inverses

a+b=b+a=0 Additive inverse of -5 is 5
a·b=b·a=1 Multiplicative inverse of -1 is -1

Complex Congugate z¯

Flip the sign of the imaginary number to get the conjugate (original a+bi) (complex con a-bi)

Eulers Identity $e^{i\pi}$+1=0

Eulers equation (e^{ix}=cosx+isinx)

Basis and Dimension

Linear independence

No linear combination of the remaining vectors

Basis

a set of vectors that span a vector space and are linearly independent

Factor out variables a(1 2 3 1)

Number of independent vectors that form a basis

Dimension of V=dim(V)

dimension of R^n is n. Dim(R^3)=3

Rank

number of pivots after rref

Nullity

non pivot rows after rref

tuple

1 column list of numbers

Dimension of nullspace

rref and solve

Row Reduction

Augmented Matrix

Represents the whole system (line at end)

RREF

Leading 1 then zero under and next leading one beside,only zeros at bottom)

Augmented RREF

rref with complete system

Gauss-Jordan (elementary row operations)

R2=R3....R1=R1-R3....R2=R1-A(R3)

Determinant

det(A)= ad-bc

row reduce

Cofactor Expansion

Remove row A(3l1) row 3 column 1 you are left with 2x2... then it factors (A31)(2x2matrix)

det(A)=A31(ad-bc) + A32(ad-bc) + A33(ad-bc)

Vectorspace

Subspace

set of vectors in W is a subset of the set of vectors in V

Spanning sets

All the matrices that form the same matrix set after

Linear Transformations

Kernel

rref and solve (1a+0b+3/10c=0 a=-3/)

Ker(T)= N(A) null space of A

Surjection (onto)

all outputs could be from 1 input

Injection (one-to-one)

different inputs different outputs

Bijection (both)

both injective and surjective

Linear Transformations (cont)

Change of Basis

t=a,b,c,d v= e,f,g,h....v to t (e,g)=e(ac) + g(bd).... (f,h)=f(a,c) + h(b,d)

Matrix Multiplication

Identity Matrix

10 01.....100 010 001

Elementary matrix is matrix after a elementary row operation

Inverse & Matrix AlgebrA

MA=In

Left inverse

AN=In

Right inverse

Inverse of a product

inverse all the matrices in set

Invertible matrices

RREF to invert the matrix

Transpose At= A11 A12 A21 A22

Switch places A12->A21

Eigenshitazz

Eignenvalue λIn-A (solve for λ)

λ-(a)-b, -c, λ-(d) then det(λ-a) = (λ-a)(λ-d) - (-b)(-c)

Eigenvector

sub in λ to matrix λ-(a)-b, -c, λ-(d) and rref and solve for x's

Multiplicities

eigenspace λ

Diagonalization

can be diagonalized if multiplicities are equal. Needs more than 1 linearly independent eigenvalues

Need to know

i	√ -1
i^2	-1
multiply 3x1 x 1x3	a11 x b11
De MOIVRE	$z^n = r^n cis(n\theta)$
cis	cos θ + isin θ or cos θ + (√ -1)sin θ
det(A)	ad-bc
R^n	
range(T) + nullity(T) = n (in m x n)	
m	row
n	column