Cheatography

Linear Algebra (MATH232) Cheat Sheet Cheat Sheet

by linAlgCheat via cheatography.com/87824/cs/20238/

VECTORS

2 vectors equal <-> same magnitude + same direction

norm/magnitude/length of vector $||v|| = \text{sqrt}(v_1^2 + ... + v_n^2)$

unit vector -> $||v|| = 1$. $(v / ||v||)$

$||cv|| = |c|\ ||v||$

distance $d(u,v) = ||u-v||$

Dot product $u \bullet v = (u_1v_1 + ... + u_nv_n)$

n $\cos(\theta) = u \bullet v / (||u||\ ||v||)$

u&v are orthagonal when $\text{dot}(u,v) = u \bullet v = 0$

Equations of Lines/Planes

vector form	$\mathbf{x} = \mathbf{x\_0} + t\mathbf{v}$
parametric in R^2	$x = x_0 + ta$, $y = y_0 + tb$
parametric in R^3	$x = x_0 + ta$, $y = y_0 + tb$, $z = z_0 + tc$
General form of plane R^3	$Ax + By + Cz = D$
point normal eq of a plane	$\mathbf{n} \bullet (\mathbf{x} - \mathbf{x\_0})$
vector eq of a plane	$\mathbf{x} = \mathbf{x\_0} + s\mathbf{v\_1} + t\mathbf{v\_2}$

Inverse Matrices

Inversion Algorithm

> $[\ A\ |\ I\ ] \rightarrow ... [\ |\ ] ... \rightarrow [\ I\ |\ A^{-1}\ ]$

Invertible Matrix Theorem

Invertible Matrix Theorem

Invertible Matrix Theorem (cont)

If A is an n x n matrix, and if T_A is the linear operator on R^n with standard matrix A, then the following statements are equivalent.

1. A is invertible.
2. The RREF of A is Identity matrix.
3. A can be written as a product of elementary matrices.
4. $A\mathbf{x} = \mathbf{0}$ has only the trivial solution: $\mathbf{x} = \mathbf{0}$
5. $A\mathbf{x} = \mathbf{b}$ has exactly one solution for every vector $\mathbf{b}$ in R^n: $\mathbf{x} = A^{-1}\mathbf{b}$.
6. $A\mathbf{x} = \mathbf{b}$ is consisten for every vector $\mathbf{b}$ in R^n.
7. The column vectors of A are linearly independent.
8. The row vectors of A are linearly independent.
9. $\det(a) \neq 0$.
10. $\lambda = 0$ is not an eigenvalue of A.
11. T_A is one-to-one.
12. T_A is onto.
13. The column vectors of A span R^n.
14. The row vectors of A span R^n.
15. The column vectors of A form a basis for R^n.
16. The row vectors of A form a basis for R^n.
17. rank(A) = n
18. nullity(A) = 0
19. A has full column rank.

EigenSTUFF

The scalar lambda(λ) is called an Eigenvalue of A when there is a nonzero vector x such that $Ax = \lambda x$.

Vector x is an Eigenvector of A corresponding to λ.

The set of all eigenvectors with the zero vector is a subspace of R^n called the eigenspace of λ.

1. Find Eigenvalues: $\det(\lambda I - A) = 0$

2. Find Eigenvectors: $(\lambda I - A)x = 0$

If A is a triangular matrix then its eigenvalues are on its main diagonal

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