Discrete Math Cheat Sheet

by Dois via cheatography.com/11428/cs/1340/

Complex Numbers

$j^2 = -1$	$j^3 = -j$
$j^4 = 1$	$z = a + bj$
$z = r(\sin\theta + j\sin\theta)$	$z = re^{j\theta}$
$\tan^{-1} b/a = \theta$	$\cos^{-1} a/r = \theta$
$\sin^{-1} b/r = \theta$	$(a + bj)^* = a - bj$
$\lvert z\rvert = r = \text{sqrt}(a^2 + b^2)$	$\lvert z\rvert^x = \lvert z^x\rvert$
$\arg(z)^x = x \arg(z)$	$\arg(z) = \theta + 2k\pi$
$(\cos\theta + j\sin\theta)^k$	$= \cos k\theta + j\sin k\theta$
$= (e^{j\theta})^k = e^{jk\theta}$	< DeMoivre's Theorum

* means conjugate

j = i = sqrt(-1) = imaginary unit

Find roots example:

$z^2 = -4j$

Convert to exponential form first:

$z^2 = 4e^{-j\pi/2}$

$\lvert z^2\rvert = r^2 = \text{sqrt}(0^2 + 4^2) = 4$

$\lvert z\rvert = r = 2$

k = (0, 1 ...n where n = expon' of z) = 0, 1

$\arg(z^2) = 2\arg(z) = -\pi/2 + 2k\pi$

$\arg(z) = -\pi/4 + k\pi$

Substitute values of k (0, 1) for $z = \lvert z\rvert e^{j\arg(z)} = 2e^{-j\pi/4}, 2e^{j3\pi/4}$

Discrete Probability & Sets & Whatever

Probability

1. $P(x) = {}^nCx \cdot p^x \cdot (1-p)^{n-x}$
2. $P(x) = ({}^XCk)(({}^{N-X})C(n-k))/{}^NCn$

Set Theory

A = B when A subset of B & B subset of A

A - B = A n B'

A u (A n B) = A

A n (A u B) = A

A u A' = U

A n A' = nullset or {}

Power set of S is the set of ALL SUBSETS of S e.g. S = {1,2} , P(S) = { {}, {1}, {2}, {1,2}}

$\lvert A\rvert = n$, $\lvert P(A)\rvert = 2^n$

Sets A and B are disjoint iff A n B = {}

Cardinality of union: $\lvert A \cup B\rvert = \lvert A\rvert + \lvert B\rvert - \lvert A \cap B\rvert$

Proof by induction:

Show that when p(k) is true, p(k + 1) follows.

1. Binomial Distribution

n = trials, x = successes, p = probability of success

2. Hypergeometric Distribution

N = deck size, n = draws, X = copies of card, k = successes

Matrix Manipulations

A^T: Transpose of A - Switch Rows with Columns (R1 becomes C1, R2 becomes C2 etc.)

-A = -1 . A

A^{-1}: Inverse of A

$A^{-1} \cdot I = I = A \cdot I$

$A^{-1}A=I$

Augment Identity matrix to matrix and perform Guass-Jordon elimination on both to get change Identity matrix to the Inverse.

EROs:

Switch Rows

Scale Row (Multiply entire row)

Add multiple of different row to another

A matrix A is in row echelon form if

1. The nonzero rows in A lie above all zero rows (when there is at least a nonzero row and a zero row).
2. The first nonzero entry in a nonzero row (called a pivot) lies to the right of the pivot in the row immediately above it.

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