IAML: Mathematical Preliminaries

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Semester 1

Basic algebra

- Manipulation of algebraic equations.
- Substitution, change of variable etc.
- Inequalities.

Functions, logarithms and exponentials

- Defining functions.
- Variable change in functions.
- Evaluation of functions.
- Combination rules for exponentials and logarithms.
- Properties of exponential and logarithm.

Geometry and Trigonometry

- Basic rules of 2D, 3D and N-D geometry.
- All the various manipulations of sin, cos and tan.

Vectors

- Scalar (dot) product, transpose.
- Basis vectors, unit vectors, vector length.
- Orthogonality, gradient vector, planes and hyper-planes.

Matrices

- Matrix addition, multiplication
- Matrix inverse, determinant.
- Linear transformation of vectors
- Eigenvalues, eigenvectors, symmetric matrices.

Calculus

- General rules for differentiation of standard functions, product rule, function of function rule.
- Partial differentiation
- Definition of integration
- Integration of standard functions.

Probability and Statistics

We will cover these topics in IAML

- Probability, events,
- Mean, variance, covariance.
- Conditional probability.
- Combination rules for probabilities.
- Independence, conditional independence
- Maximum likelihood estimation
- Hypothesis testing