Learning from Data: Preliminaries

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http://www.anc.ed.ac.uk/~amos/lfd/

Basic algebra

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

Functions

- Defining functions.
- Variable change in functions.
- Functions of functions.
- Evaluation of functions.

Polynomials

- Inequalities.
- Solving quadratic and polynomial equations.
- Roots.

Logarithms and exponentials

- Combination rules for exponentials and logarithms.
- Properties of exponential and logarithm.
- Complex numbers would be helpful.
- Hyperbolic functions would be helpful.

Geometry and Trigonometry

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

Matrices and Vectors

- Matrix and vector algebra, matrix inverse, determinant.
- Eigenvalues, eigenvectors, symmetric matrices.
- Rotation and reflection matrices, Polar co-ordinates.
- Dot product, cross product, transpose.
- Basis vectors, unit vectors, vector length.
- Orthogonality, gradient vector, planes and hyper-planes.

Differentiation

- General rules for differentiation of standard functions, product rule, function of function rule.
- Partial differentiation, change of variables.
- Summation convention, differentiation w.r.t vectors.
- Taylor expansion.

Integration

- Standard integration functions.
- Chain rule.
- Change of variables.
- Exact integration.

Probability and Statistics

- Probability, events,
- Mean, variance, covariance.
- Conditional probability.
- Combination rules for probabilities.
- Independence and mutual exclusivity.