## Sketch of Numerical Methods

Weinan  $E^{1,2}$  and Tiejun  $Li^2$ 

<sup>1</sup>Department of Mathematics, Princeton University, Princeton, NJ 08544, USA *Email: weinan@princeton.edu* 

<sup>2</sup>School of Mathematical Sciences, Peking University, Beijing 100871, P.R. China *Email: tieli@pku.edu.cn* 

Lect1	Introduction
Chap1	Solving linear system
Lect2	Direct methods for solving linear system
Lect3	Iterative methods for solving linear system
Lect4	Eigenvalue problem for linear system
Lect5	Singular value decomposition and applications (PCA)
Chap2	Optimization
Lect6	Linear programming
Lect7	Nonlinear programming
Lect8	Integer programming and other topics
Chap3	Solving nonlinear system
Lect9	Solving nonlinear system
Chap4	Approximation of functions
Lect10	Polynomial interpolation (with ENO)
Lect11	Fast Fourier Transform (FFT)
Lect12	Wavelets and applications
Chap5	Numerical integration
Lect13	Numerical integration: basics
Lect14	Numerical integration: adaptive and Gaussian quadrature
Chap6	Monte Carlo methods
Lect15	Generation of RVs
Lect16	Monte Carlo integration
Lect17	Metropolis algorithm and SSA
Lect18	Simulated annealing and Genetic algorithm
Chap7	Numerical ODEs
Lect19	One-step method for numerical ODEs
Lect20	Multi-step method and stability condition
Lect21	Stability regions and stiff ODEs
Lect22	Symplectic algorithm