

## Syllabus for the Applied Mathematics qualifying exam in Numerical Analysis, Numerical Differential Equations and Optimization:

### **Intro to Numerical Analysis:** (Trefthen and Bau)

- \* Fundamental of Matrix Computations: Lectures 1-5
- \* QR Factorizations and Least Squares: Lectures 6-8, 10, 11
- \* Condition and Stability: Lectures: 12, 14-19
- \* Linear System of Equations: Lectures: 20-23
- \* Eigenvalues and SVD: Lectures: 24-31

### **Numerical Differential Equations:** (Randall LeVeque)

- \* Finite Difference Approximations:

1.1, 1.2, 1.3, 1.4

2.2, 2.5-2.9

- \* Initial Value Problems:

5.1, 5.2, 5.4, 5.5-5.9

- \* Stability and Stiffness:

6.4, 7.1-7.3, 8.2, 8.4

### **Nonlinear Systems and Optimization:** (Dennis and Schnabel)

- \* Nonlinear problems in one variable:

2.2, 2.4, 2.5, 2.7

- \* Newton's method for nonlinear equations :

5.1, 5.2, 5.4, 5.5, 5.6

- \* Quasi-Newton Methods:

6.1, 6.2, 6.3, (6.4)

- \* Nonlinear Least Squares:

10.1, 10.2, 10.3