

## Numerical Methods

### Homework 6

Due: Wednesday, May 22nd, 11:00am  
or per email on Tuesday to [cpopov59@gmail.com](mailto:cpopov59@gmail.com)

#### 1. Eigenvalue methods

Show that the eigenvalues of the matrix

$$A = \begin{pmatrix} -\frac{a_{n-1}}{a_n} & -\frac{a_{n-2}}{a_n} & \dots & -\frac{a_2}{a_n} & -\frac{a_1}{a_n} & -\frac{a_0}{a_n} \\ 1 & 0 & \dots & 0 & 0 & 0 \\ 0 & 1 & & & 0 & 0 \\ \vdots & & \ddots & & \vdots & \vdots \\ 0 & & & 1 & 0 & 0 \\ 0 & 0 & \dots & 0 & 1 & 0 \end{pmatrix}$$

are the roots of the polynomial

$$P(x) = \sum_{i=0}^n a_i x^i.$$

#### 2. Complex numbers

Program a new data type for complex numbers. (*In C/C++ this can be done using a struct or by defining a new class.*) Write functions or operators for addition, subtraction, multiplication, division and absolute value. Test each operation at least once in a main()-program.