

**MATH 5610/6860**  
**COMPUTER LAB # 2**

1. Consider the sequence  $\{x_n\}$ ,

$$x_1 = 2, \quad x_2 = 3,$$

$$x_{n+1} = x_n - \frac{x_n^2 - 2}{x_n + x_{n-1}}, \quad n \geq 2.$$

- a. Estimate numerically the convergence rate of this sequence to  $\sqrt{2}$  (i.e. if the convergence is linear, superlinear, quadratic, etc. . .)
  - b. How would you estimate the convergence rate if the true value of the limit was not known?
2. Numerically verify the following assertions,
- a.  $1/(n \ln n) = o(1/n)$
  - b.  $1/n = o(1/\ln n)$
  - c.  $(2n - 1)/n^3 = \mathcal{O}(1/n^2)$
3. Reproduce the example given in class that shows that a relative error less than machine epsilon is not guaranteed for several arithmetic operations (keep in mind Matlab uses double precision).