ESCI7205 hw6

Tu., Nov. 3, 2009. Due Th, Nov. 5, 2009.

Intro to Matlab.

1) Intro to round off errors.

Write a Matlab program to estimate the value of pi using the algorithm

$$t_0 = 1/\sqrt{3}$$

$\pi \approx 6\left(2^i t_i\right)$ as $i \to \infty$, where the t_{i+1} are given by

$$t_{i+1} = \frac{\sqrt{t_i^2 + 1} - 1}{t_i}, \quad \text{or} \quad t_{i+1} = \frac{t_i}{\sqrt{t_i^2 + 1} + 1}$$

a) First show that the two ways to calculate t_{i+1} are mathematically equivalent (i.e. show they are equal). This is not a computer exercise.

b) Calculate the first 24 iterations using both forms of the iteration equation. Discuss the accuracy of the estimation of π calculated using each form as a function of the iteration. Make a plot that displays the difference. (Should this plot be linear or semi-log?)

c) Discuss what is happening to the approximations?

d) Next calculate the 25th and 26th iterations. Discuss what happens here.

2) Write a Matlab program to plot a circle.