Assignment 1

Found Sci Comp
Week 4 Wed
Calum Lynch

1. iii) Looking at vector x_n, the x_n values start deviating from 4 at $n = 10$ and fully fails at $n = 12$

at $n = 10$ the value $5^{-n\times 2}$ becomes small enough matlab adversely approximates $4 - (x_n^2 5^{-n\times 2})$ and at $n = 12$ matlab approximates $4 - (x_n^2 5^{-n\times 2})$ to 4

iv) $$x_{n+1} = 5^n \sqrt{4 - (2 - \sqrt{4 - (x_n/5^n)^2})}$$

$$= 2 \times 5^n \frac{\sqrt{2 - \sqrt{4 - (x_n/5^n)^2}}\ \sqrt{2 + \sqrt{4 - (x_n/5^n)^2}}}{\sqrt{2 + \sqrt{4 - (x_n/5^n)^2}}}$$

assuming n, x are positive real numbers

$$= \frac{2 \times 5^n \times 5^{-n} x_n}{\sqrt{2 + \sqrt{4 - (x_n/5^n)^2}}}$$

$$x_{n+1} = \frac{2 \times x_n}{\sqrt{2 + \sqrt{4 - (x_n/5^n)^2}}} \quad y_{n+1} = \frac{4 y_n}{\sqrt{4 + \sqrt{4 - (y_n/5^n)^2}}} = y_{n+1}$$

2. b. i) Converges ii) does not Converge iii) does not Converge

iv) Converges