Mh4718 Worksheet 11

1. Prove that 1 is a fixed point of $(2x-1)^{\frac{1}{3}}$ and that fixed point iteration is locally convergent to it.

2. Solve the following system of equations by hand and then write a C++ program that uses Jacobi iteration to estimate a solution.

$$\begin{aligned} 3x - y + z &= 4 \\ -x + 4y + 2z &= 7 \\ 5x - 2y + 8z &= 19 \end{aligned}$$

3. Write a C++ program that uses Jacobi iteration to estimate a solution for the system of equations

$$\begin{aligned} 4x + y + w &= 1 \\ x + 4y + z + v &= 2 \\ y + 4z + w &= -1 \\ x + z + 4w + v &= 2 \\ y + w + 4v &= 1 \end{aligned}$$

4. The following program seeks to estimate a solution for a system of linear equations. What are those equations?

```
#include <iostream>
#include <cmath>
using namespace std;
void main()
{
double M[3][3] = {{0,-0.5,0},{0.6,0,0.2},{0.25,-0.5,0}};
double c[3]= {0,5,3.5};
double x[3]={1,0,0};
double nx[3];
double distance;
do
{
nx[0] = M[0][0]*x[0]+M[0][1]*x[1]+M[0][2]*x[2]+c[0];
nx[1] = M[1][0]*x[0]+M[1][1]*x[1]+M[1][2]*x[2]+c[1];
nx[2] = M[2][0]*x[0]+M[2][1]*x[1]+M[2][2]*x[2]+c[2];
distance = sqrt((nx[0]-x[0])*(nx[0]-x[0])+(nx[1]-x[1])*(nx[1]-x[1])
                                          +(nx[2]-x[2])*(nx[2]-x[2]));
x[0]=nx[0];x[1]=nx[1];x[2]=nx[2];
}while(distance >0.0001);
cout<<"Estimate for the solution:"<<endl;
cout<<x[0]<<"\t"<<x[1]<<"\t"<<x[2]<<endl;
}
```