COMPUTATIONAL AND NUMERICAL METHODS

Lab-7

Date: 24-10-2016

Numerical Differentiation

1). Using the following data, Find f' (6.0) and f'' (6.3).

X	6.0	6.1	6.2	6.3	6.4
F(x)	0.175	-0.1998	-0.2223	-0.2422	-0.2596

By using any of the

a) Newton's forward difference operator.

b) Newton's backward difference operator.

2) Find the numerical approximation derivative of 2^{nd} order $D_n^2 f(x)$ for the function

$F(x) = \tan^{-1}(100x^2-199x+100)$ at x=1.

Using the following approximation formulas

1) $D_n^2 f(t)=A f(t-h)+Bf(t)+C f(t+h)$ (1)

2) $D_n^2 f(t)=A f(t+2h)+Bf(t+h)+C f(t)$ (2)

3) $D_n^2 f(t)=A f(t-2h)+B f(t-h)+C f(t)+D f(t+h)+E f(t+2h)$ (3)

Take the following step sizes in each case.

1) h=0.1

2) h=0.05

3) h=0.025

4) h=0.0125

5) h=0.00625

Estimate the error bound. Plot the error for each of the method for all the step sizes.

See the effect when we go on decreasing the step size.

Also compare the methods given in (1), (2), (3). What will happen when we add more and more nodes?