# Department of Computing

# MATH 333: Numerical Analysis

# Class: BSCS-9ABC

# Lab 8: Newton’s Forward/ Backward Difference Interpolation Formula

# Date: March 30, 2022

# Time: 10:00 am-1:00pm & 2:00 pm-5:00 pm

# Lab Engineer: Anum Asif

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| **SUBMITTED BY:**  **Fatima Seemab**  **291310**  **Lab 8** |

**Lab 08: Newton’s Forward/ Backward Difference Interpolation Formula**

**Lab Task**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| The following table gives pressure of a steam at a given temperature. Using Newton’s Forward Difference formula,   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Temperature | 140 | 150 | 160 | 170 | 180 | | Pressure, | 3.685 | 4.854 | 6.302 | 8.076 | 10.225 |   Find the interpolating polynomial for pressure. |

**CODE:**

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| --- |
| %%  clear  clc  syms z  x=[140 150 160 170 180]; % inputting values of x  fx=[3.685 4.854 6.302 8.076 10.225]; % inputting values of y  dt=zeros(5,10); % function  for i=1:5  dt(i,1)=x(i);% for loop  dt(i,2)=fx(i); % calling function  end  h = x(2)-x(1) % finding the value of h  n=4; % number of iterations  for j=3:10  for i=1:n  dt(i,j) = (dt(i+1,j-1)-dt(i,j-1))/h;  end  n=n-1;  end  s=(z-x(1))/h  f0 = fx(1);  f01 = dt(1,3);  f02 = dt(1,(3+1));  f03 = dt((1),(3+2));  f04 = dt((1),(3+3));  % using the forward interpolation formula  polynomial = (f0)+(s\*f01)\*h+(s\*(s-1)\*f02)\*h^2+(s\*(s-1)\*(s-2)\*f03)\*h^3+(s\*(s-1)\*(s-2)\*(s-3)\*f04)\*h^4 |

**OUTPUT**

Graphical user interface, application

Description automatically generated with medium confidence

**TASK 1 part b**

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| 1. Compute the pressure for a temperature of . |

**OUTPUT**

Table

Description automatically generated

**TASK 2**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. The speed of a train, running between two stations is measured at different distances from the starting station. If  is the distance in  from the starting station, then , the speed (in  ) of the train at the distance  is given by the following table:  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | |  | 0 | 50 | 100 | 150 | 200 | 250 | |  | 0 | 60 | 80 | 110 | 90 | 0 |   Find the approximate speed of the train at the midpoint between the two stations. |

**CODE**

|  |
| --- |
| x=[0 50 100 150 200 250]; % inputting values of x  fx=[0 60 80 110 90 0]; % inputting values of y  dt=zeros(6,10); % function  for i=1:6  dt(i,1)=x(i);% for loop  dt(i,2)=fx(i); % calling function  end  n=5; % number of iterations  for j=3:10  for i=1:n  dt(i,j)=dt(i+1,j-1)-dt(i,j-1)  end  n=n-1;  end  h=x(2)-x(1) % finding the value of h  xp=(min(x)+max(x))/2; % defining the value of xp  for i=1:5  q=(xp-x(i))/h; % calculating number of intervals  if (q>0&&q<1)  p=q;  end  end  p  l=xp-(p\*h)  for i=1:5  if(l==x(i))  r=i;  end  end % calculating different value of y  f0=fx(r);  f01=dt(r,3);  f02=dt(r,(3+1));  f03=dt((r),(3+2));  f04=dt((r),(3+3));  % using the forward interpolation formula  fp=(f0)+((p\*f01)+(p\*(p-1)\*f02)/(2)) + ((p\*(p-1)\*(p-2)\*f03)/(6))+((p\*(p-1)\*(p-2)\*(p-3)\*f04)/(24)) |

**OUTPUT**

**Table

Description automatically generated**

**Help:**

<https://www.codewithc.com/newtons-interpolation-in-matlab/>

**Deliverables**

Submit single word file with matlab code and screen shot of Output.