***NAME: JAVERIA SALEEM***

***ROLL NUMBER: 2019-CS-085***

***SECTION – 5\_B***

**ASSIGNMENT NO 2**

**Q.No.1**

Consider the iteration = g() when the function g(x)=-/4 is used. The fixed point can be found by solving the equation x=g(x).

i) Compute the two solutions ii) Write the property that the fixed-point iteration process will converge to a unique fixed point. iii) What will happen when iv) From the table given below, discuss the converging/diverging behavior of iterations for both cases.

|  |  |
| --- | --- |
| **Case 1 over interval [-3,-1]** | **Case 2 over interval [1,3]** |
| X=-2 | X=2 |
| =-2.05 | =1.6 |
| =-2.100625 | =1.96 |
| =-2.20378135 | =1.9996 |
| =-2.41794441 | =1.99999996 |
| ⸽ | ⸽ |
| ⸽ | ⸽ |
| = -∞ | = 2 |

***Compute the two solutions***

**Case 1 (X = -2):**

Start with X0 = -2.05

We get

X1 = -2.100625

X2 = -2.20378135

X3=-2.41794441

..... {\displaystyle \infty }

Therefore, if |g'(x)| > 1 then sequence will not converge to X = -2

**Case 2 (X = 2):**

Start with X0 = 1.6

We get

X1 = 1.96

X2 = 1.9996

X3 = 1.99999996

..... 2

Therefore, if |g'(x)| < 1 then sequence will converge to P = 2

***Write the property that the fixed-point iteration process will converge to a unique fixed point.***

Two methods in which fixed point technique is used:

1. ***Newton Raphson Method***

*Formula*

{\displaystyle x\_{n+1}=x\_{n}-{\frac {f(x\_{n})}{f'(x\_{n})}}}where,

- Initial point

() is the value of the function at that point

() is the value of the differentiated function at that point.

Plug all these values into the above equation to get xn+1. It becomes the next initial point. Repeat until you get a point within an acceptable degree of error

1. ***Secant Method***

Used to avoid differentiated form in Newton Raphson's method. Only problem is you need two initial points for this method (& )

*Formula*

{\displaystyle x\_{n}=x\_{n-1}-f(x\_{n-1}){\frac {x\_{n-1}-x\_{n-2}}{f(x\_{n-1})-f(x\_{n-2})}}}

Similar to Newton Raphson's method plug in all values to generate next approximation.

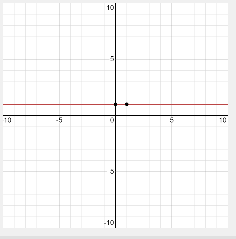
***What will happen when***

Graph the line using the slope and y-intercept, or two points.

Slope: 00

Y-intercept: (0, 1) (0, 1)

|  |  |
| --- | --- |
| **X** | **Y** |
| 0 | 1 |
| 1 | 1 |



**Q.No.2:**

Heat capacity is treated as a function of temperature in phase change temperature range (between melting and solidification). Calculation process is controlled for phase change materials by both: temperature and total latent energy. Below melting temperature T the material is fully discharged and enthalpy energy H is stored as specific heat. For a process in which the pressure is constant, the specific heat capacity equals the slope of the relationship between specific enthalpy and the temperature as follows

i) Compute Specific heat capacity at T=1300.

ii) Also compute total error bound of O () for f(x) = sin(x) over[0,10].The inherent round-off error has the bound || and step size h=0.1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| T( | 800 | 1000 | 1200 | 1400 | 1600 |
| H(Btu/Lb) | 1305 | 1460 | 1585 | 1705 | 1825 |

**ANSWER:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **T(** | **H(Btu/Lb)** |  |  |  |  |
| ***800*** | *1305* |  |  |  |  |
| ***1000*** | *1460* | 155 |  |  |  |
| ***1200*** | *1585* | 125 | -30 |  |  |
| ***1400*** | *1705* | 120 | -5 | 25 |  |
| ***1600*** | *1825* |  | 0 | 5 | -20 |

Here, X0 = 1400, ;

So, u = =

***i) So, using newton’s forward difference,***

|T=1300 = [120+0+]

|T=1300 = [120+0+]

|T=1300 = [120+]

|T=1300 =0.624

So, Cp at T = 1300 = 0.624

***ii) In this part, it’s not given at which point we need to determine error bound.***