Mathematics - A course Class : B.Sc Part - I Book: Calculus with Analytic Geometry Newton - Raphson Method: Exercise 2.4 $X_{n+1} = X_n - \int (x_n)$ Use the Newton-Raphson method to approximate, up to four Places of decimal, a root of each of the following: 1. x3 - 3x -3 =0 with x0 = 2 Sol: x3-3x-3=0 -> ear(17. Then differentiate early writ "x". 3x2-3 ear (1)1. Now By using Newton-Raphson method: 1/n+1 = Xn - f(xn) Put n=0 :-X0+1 = X0 - [(x0) x, = 2 - [-1] $x_1 = 2 + \frac{1}{9}$ At h=1:x5 = x1 - t(x1) ti: 2.111 - 610753 10.3702 X2 = 2.1111 - 0.0072 X2 = 2.1039 13 - K2 - f(x2)

13 = 2. 1039 - 6.000 9 1, ×3 = 2. 1039 10.2791

Chapter No: 02 The Derivative Page: 01 : The value of x = 2 given in olivestion. : By Putting the value of xo=2 in early we get = -1 :- By Putting the value of xo=2 in early we get of as the root " 2. 1039" repeated two times so the Reavired root is [2.1039] Ans. x = 2.1039 Ans

Mathematics - A course. Class: B.Sc Part 1 Book: Calwins with Analytic Geometry 2. x3 - 5x +3 =0 with x0=0 Expresse set 2.4

By using Newton's Raphion method: Xn+1 = Xn - f(xn) f' (xn) x3-5x +3=0 -> eartin harm marger and all 3x2-5 -> meser in the series to the series to the series Put n=0: $X_1 = 0 + \frac{3}{5}$ X = 0.6000 Put n=1 in eartil $x^{1+1} = x^{1} - \frac{\xi_{1}(x^{1})}{\xi_{1}(x^{1})}$

12 = 0.6000 - 0.2160 - 3.9200 x2 = 0-6000 + 0.2160 3.9200 X2 = 0.6000 + 0.0551 Xr = 0.6521 Put n= 2 in earli):x2+1 = X2 - f(x1) x3 = 0.6551 - 0.0056 Y3 = 0.9221 + 0.0028 x3 = 0.6551 + 0-0015

Chapter No: 0,2 The Derivative Page: 02

9-2-3:57.1 .. By Putting the value of $X_{0+1} = X_0 - \frac{f(x_0)}{f'(x_0)}$ is in early we get 3 $X_1 = 0 - \frac{3}{-5}$ is By Putting the value of $X_1 = 0 - \frac{3}{-5}$ to in early we get - 5

> Put n=3 in eouti) x3+1 = x3 - f(x3) xu= 0.6566 - 0 - 3.7066 X4 = 0-8289 + 0 x4= 0.8288 Since the root 0-6566 is repeated two times so rearrised mut 15 (x = 0-6566 X= 0-6566 | Ans

Mathematics - A course Class: B.Sc part-I Book: Colculus with Analytic Geometry By using Newton's Raphson Method: Xn+1 = xn - f(xn) e-x - sinx =0 _ earli) -e-x - (0)x -> eov(1) Puk n=0 in ear til :-X0+1 = X0 - f(x0) \$1(x0) X1 = 0.5 - 0.1269 -1.4340 x = 0.5 + 0.0855 VI = 0-2826 Put n=1 in earlil :xi+1 = xi - f(xi) 1= 0.5855 - 0.0041 - 1-3902 x1 = 0-5855 + 0.0029 12 0.5884 Put n= 2 in earli :-X3 = X2 - f(X2) f' (x2) 12 = 0.2881 - 0.0005 B = 0-5884 + 0-00-1 es= 0.2882

Chapter No: 02 The Derivative Page: 03 3. e-x - sinx = 0 with x = 0.5 Put n=3 in earli) X361 = X3 - & (13) x4 = 0.2882 - 0 -1.3868 xu = 0.5885 to x4 = 0.5885 since the root 0.588 t 15 repeated two times so the rearrived root is 1 x = 0.5885 X=0-5885 Ans.

Mathematics - A Course Class: B.Sc part 1 Book: Calculus with Analytic Geometry Parge: 04 4. ex-3x =0 with x0 = 0 By using Newton's Raphson method: $x_{n+1} = x_n - \frac{f(x_n)}{f(x_n)}$ $\begin{cases} \frac{P \cup f(x_n)}{x_{3+1}} = x_3 - \frac{f(x_3)}{f(x_3)} \end{cases}$ ex - 3x =0 -> ear (1). ex - 3 -> earlist. Put no in each). XUH = KO - f(XU) 11: 0-1 X1 = 0 + 0-5000 Tri = 0-5000 Put n=1 in ear (1). xini = xi - flxi) f'(4) 12= 0.5000 - 0.1487 xr = 0.2000 + 0.1100 KL = 0-6100 Put n=2 in earli1: Xz+1 = Le - fle) FI (xe) 41= 0.6100 - 0.0104 -1-1596 x3 = 6.6100 + 0.0089

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Exercise 2.4

xn = 0.918d - 0.0007 -1.1437 Xy = 0.6189 + 0.0001 1x4 = 0.6190 Put n= 4 in earli). X44 = X4 - \$(X4) 15 = 0-6190 - 0 -1-1433 15: 0.6190 FG X5 = 0.6190

Since By the following 116.6140" repealed two times so the the reducined root is 0-6140.

1 x = 0.6190 Tans.

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                             Exercise 2-4
5.) 4 sinx = ex in the intervals ] 0, 0.5 [
 fin: 4 smx = ex -> early
 early =>fu=4 sin x -e x -> earli).
     Now in the avvestion we have to find the value to
    Then put the value of the intervals ] 0.0.5 [ In earliss.
    flo) = 4 sin(0) - e0
  fiv) = 0-1
                                     : Sino = 0
  (flo) = -1
  Now at interval '0.5 : put in ear (2).
  flors) = 4 sim (o.s) - eo.s
         = 4 (0.4794) - 1.6487
        = 1-9171 - 1-6487
 , flors) = 0.2689
                                i. The value of 10=0-2618
 X0 = 0-2618
   f'(x) = Usinx-ex -) early)
  Differentiating entity wiret uxil
         = 4 cost - ex
 Now By using Mewton's Raphson method: -
      x_{n+1} = x_n - f(x_n)
 Put n=0
    \chi_{0+1} = \chi_0 - \frac{f(\chi_0)}{f(\chi_0)}
     K1= 0-2618 - (-0.264)
         = 0.2613 + 2.5648
0-264
                          2-5 640
    V. K1 = 0.3647 6-1029
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Put n=4 in (i) $x_{1+1} = x_1 - f(x_1)$ $x_2 = 0.3647 - (-0.0134)$ the ment appears when missing they X2 = 0.3647 + 0.0134 (x2 = 0.3705) 2.2968 Put n=2 Inli) X2+1 = X2 - f(X2) X3 = 0.3705 - (-0.0001) 2.2807

X3 = 0.3705 + 0.0000

X3 = 0.3705

Hence the required root is 0.3705 because it repeated two times in the ear. ear

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X= 0-3705 Ans.

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                        Exercuse 2.4
6)-
   Sinx = 1-x with x0 = 0.
     So1:-
     By using Newton-Raphson method:
    X_{n+1} = X_n - \int (x_n)
fly: 1-x-sinx=0 -> ewli).
 fili) = -1 - (osx -) ew (ii).
  Put no in earli) :-
  X_1 = X_0 - f(x_0)
   X1= 0 - 1
   x1: 0+ /2 => /x1 = 0.5000
 Put n= 1 in eali).
 x_{i+1} = x_n - \frac{f(x_i)}{f'(x_i)}
 x= 0.8000 - (-6.0206)
    = 6. 5000 F 6-0109
 100 = 0.2110
 Put n=2 in earlin:
 Liti = Ka - f (Ki)
 x3 = 0.5110 - 0
1.8723
  x3 = 0.5110 - 0
 1x3= 0.2110
  As "0-5110" is repeated two times so this is a
                 ( x= 0-5110 Ans. (The End).
           root.
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