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Questions:

(a) Using Newton- Raphson method, find the real root of the equation by taking the initial guess correct to four decimal places.

Solution:

**Newton Rapshon method:**

**Formula: xn+1= xn - f(xn)/ f'(xn)**

x0= 0.6

f(x)= 3x-cos(x)-1

Derivative of the eq:

f'(x)= 3+sinx **:derivative of cosx= -sinx and der. of 1 = 0**

**For n=0;**

x0+1= x0 - f(x0)/ f'(x0)

x1= x0 - f(x0)/ f'(x0)

x1 = 0.6 - [3x-cos(x)-1/ 3+sinx]

=0.6 - [3(0.6)-cos(0.6) -1/ 3+sin(0.6)]

=0.6 - [ 1.8 - 0.9999 - 1/ 3+ 0.01047]

=0.6 - [ -0.1999/3.01047]

=0.6+0.0664

**x1=0.66641**

**For n= 1**

x1+1= x1 - f(x1)/ f'(x1)

x2= x1 - f(x1)/ f'(x1)

= 0.6664 - [3(0.6664)-cos(0.6664)-1/3+sin(0.6664)]

=0.6664 - [1.9992 - 0.9999 - 1/ 3+0.0116]

=0.6664 - [-0.0007/3.0116]

=0.6664+0.0012

**x2=0.6676**

**for n=2**

x2+1= x2 - f(x2)/ f'(x2)

x3= x2 - f(x2)/ f'(x2)

= 0.6676 - [3(0.6676) -cos(0.6676) -1/3+sin(0.6676)]

= 0.6676- [2.0028 - 0.9999 -1/ 3+0.01165)]

=0.6676 - [0.0029/3.01165]

=0.6676-0.0009

**x3=0.6667**

**For n= 3**

x4= x3 - f(x3)/ f'(x3)

= 0.6667 - [ 3(0.6667) -cos(0.6667) -1/ 3+sin(0.6667)]

=0.6667 - [ 2.0001 - 0.9999 - 1/ 3+0.01164]

=0.6667 - [ 0.0002/ 3.01164]

=0.6667 - 0.0002

**x4=0.6665**

(b) Using Regula Falsi method, find the real root of the equation on the interval [ 0, 1] correct to four decimal places.

Solution:

**Regular falsi method:**

**x0 = 0 x1 = 1**

f(x)= cos(x)+1-3x

**Put 0**

f(0) = cos(0)+1-3(0)

=1+1-0 = 2

**Put 1**

f(1) = cos(1)+1-3(1)

=0.9998+1-3 = -1.00016

**now for n=1**

**formual: xn+1= xn - [xn - xn-1 / f(xn) - f(xn-1) ]\*f(xn)**

: x1+1= x1 - [x1 - x1-1 / f(x1) - f(x1-1) ]\*f(x1)

: x2= x1 - [x1 - x0 / f(x1) - f(x0) ]\*f(x1)

Put the values of x0, x1, f(x1), f(x0)

: x2= 1 - [1 - 0 / (-1.00016) - 2 ]\*(-1.00016)

x2= 1 - [1 - 0 / (-1.00016) - 2 ]\*(-1.00016)

=1- [1/ -3.00016]\*(-1.00016)

=1-[-1.00016/-3.00016]

=1-0.3333

**x2=0.6667**

f(x2) = cos(0.6667)+1-3(0.6667)

=0.9999+1-2.0001

**f(x2) = -0.0002**

**Now for n=2**

x2+1= x2 - [x2 - x2-1 / f(x2) - f(x2-1) ]\*f(x2)

x3= x2 - [x2 - x1 / f(x2) - f(x1) ]\*f(x2)

put the values of x2, x1, f(x1), f(x2)

x3= 0.6667- [0.6667- 1 / (-0.0002) - 1 ]\*(-0.0002)

=0.6667-[(-0.3333)/ (-1.0002)]\*(-0.0002)

=0.6667-[(0.0000666)/(-1.0002)

=0.6667+0.0001

**x3=0.6668**

f(x3) = cos(0.6668)+1-3(0.6668)

=0.9999+1-2.0004

**f(x3) =0.0005**

**now for n=3**

**x4= x3 - [x3 - x2 / f(x3) - f(x2) ]\*f(x3)**

put the values of x3, x2, f(x2), f(x3)

= 0.6668-[0.6668-0.6667/0.0005+0.0002]\*0.0005

=0.6668-[0.0001/0.0007]\*0.0005

=0.6668-[0.0001/0.0007]

=0.6668-0.14285

**x4=0.5239**