Q 1) Using python find the correct root of the function x5+3x+1, in [-2,0] using Newton Raphson Method correct up to 4 decimal places.

def newtonRaphson(f,g,x0,e):  
 step =1  
 condition=True  
 while condition:  
 if g(x0)==0.0:  
 print('Divided by zero error!')  
 break  
 x1=x0-(f(x0)/g(x0))  
 print('Iteration=',step,'x1=',x1,'and f(x1)=',f(x1))  
 x0=x1  
 step=step+1  
 condition=abs(f(x1))>e  
 print('required root is',x1)

from math import\*  
def f(x):  
 return x\*\*5+3\*x+1  
def g(x):  
 return 5\*x\*\*4+3  
newtonRaphson(f,g,-1,0.00001)

Output:

C:\Users\User\PycharmProjects\pythonProject1\venv\Scripts\python.exe C:\Users\User\PycharmProjects\pythonProject1\main.py

Iteration= 1 x1= -0.625 and f(x1)= -0.970367431640625

Iteration= 2 x1= -0.3671251540907027 and f(x1)= -0.10804461570507762

Iteration= 3 x1= -0.33216864216479164 and f(x1)= -0.000549758972307135

Iteration= 4 x1= -0.3319890334452413 and f(x1)= -1.1816691403154778e-08

required root is -0.3319890334452413

Process finished with exit code 0

Q 1) Using python find the correct root of the function ex – 3x , in [0,1] using Regula Falsi Method correct up to 4 decimal places.

def falseposition(f,x0,x1,e):  
 if(f(x0)\*f(x1))> 0.0:  
 print('givenguess values do not bracker the root')  
 print('try again with different guess values')  
 else:  
 step = 1  
 condition = True  
 while condition:  
 x2=x0 - (x1-x0)\*f(x0)/(f(x1) - f(x0))  
 print('Iteration =',step,'x2=',x2,'and f(x2)=',f(x2))  
 if (f(x0)\*f(x2))>0:  
 x1=x2  
 else:  
 x0=x2  
 step = step+1  
 condition=abs(f(x2))>e  
 print('Required root is:',x2)

from math import\*  
def f(x):  
 return exp(x) - 3\*x  
falseposition(f,0,1,0.00001)

#output:

Iteration = 1 x2= 0.7802027171056979 and f(x2)= -0.15869361924908532

Required root is: 0.7802027171056979

Iteration = 2 x2= 0.49667861013833575 and f(x2)= 0.15321847815399692

Required root is: 0.49667861013833575

Iteration = 3 x2= 0.67398750657428 and f(x2)= -0.05991710786146842

Required root is: 0.67398750657428

Iteration = 4 x2= 0.5859188318405901 and f(x2)= 0.03888454293375232

Required root is: 0.5859188318405901

Iteration = 5 x2= 0.636140979796306 and f(x2)= -0.019246515028670697

Required root is: 0.636140979796306

Iteration = 6 x2= 0.6094599347123388 and f(x2)= 0.011057909883293027

Required root is: 0.6094599347123388

Iteration = 7 x2= 0.6242103092195668 and f(x2)= -0.00585972445809424

Required root is: 0.6242103092195668

Iteration = 8 x2= 0.616227867262644 and f(x2)= 0.0032455254517815835

Required root is: 0.616227867262644

Iteration = 9 x2= 0.6205987476155731 and f(x2)= -0.0017548389896366867

Required root is: 0.6205987476155731

Iteration = 10 x2= 0.618220621507651 and f(x2)= 0.0009613818598548374

Required root is: 0.618220621507651

Iteration = 11 x2= 0.6195190379107248 and f(x2)= -0.0005229308272882705

Required root is: 0.6195190379107248

Iteration = 12 x2= 0.6188114682386073 and f(x2)= 0.00028555455870593605

Required root is: 0.6188114682386073

Iteration = 13 x2= 0.619197456482367 and f(x2)= -0.00015559976504375683

Required root is: 0.619197456482367

Iteration = 14 x2= 0.6189870137877799 and f(x2)= 8.488544633666883e-05

Required root is: 0.6189870137877799

Iteration = 15 x2= 0.619101783505825 and f(x2)= -4.6278839327618115e-05

Required root is: 0.619101783505825

Iteration = 16 x2= 0.619039201729588 and f(x2)= 2.5239554627409788e-05

Required root is: 0.619039201729588

Iteration = 17 x2= 0.6190733295228218 and f(x2)= -1.3762556537733062e-05

Required root is: 0.6190733295228218

Iteration = 18 x2= 0.6190547195022755 and f(x2)= 7.5051806800452425e-06

Required root is: 0.6190547195022755

Process finished with exit code 0

Q3) Write a python program to estimate the value of the integral using Simpson,s (1/3)rd rule.

def simpson13(f,a,b,n):  
 h=(b-a)/n  
 result = f(a) + f(b)  
 for i in range (1,n):  
 k=a+i\*h  
 if i%2 ==0:  
 result = result + 2\*f(k)  
 else:  
 result = result + 2\*f(k)  
 result = (h/3)\*result  
 return result  
from math import\*  
def f(x):  
 return x\*exp(x)  
simpson13(f,0,10,8)

Q4) Write a python program to estimate the value of the integral using Trapezoidal rule (1/3)rd rule.where f(x) = sinx.on interval [0,2π] with h= π/4.

Soln: n= 8 intervals

def trapezoidal(f,a,b,n):  
 h=float(b-a)/n  
 result = f(a) + f(b)  
 for i in range (1,n):  
 result = result + 2\*f(a+i\*h)  
 result = (h/2)\*result  
 return (result)  
from math import\*  
def f(x):  
 return (sin(x))  
trapezoidal(f,0,2\*pi,8)