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MATH446

MATLAB Data

**STEP1**

**newton.m run to find the root around 2.46:**  
  
f=@(x) ((12\*x)\*(x^(1/2))) - ((8+12\*pi)\*x) + ((24\*x^(1/2) - 16)\*sin(x^(1/2))) + ((3\*pi^2 + 8\*pi - 24)\*x^(1/2)) - (2\*pi^2) + 16;

df=@(x) (18\*x^(1/2)) + ((-24 + 8\*pi + 3\*pi^2)/(2\*x^(1/2))) + ((12\*sin(x^(1/2)))/(x^(1/2))) + (((24\*x^(1/2) - 16)\*cos(x^(1/2)))/(2\*x^(1/2))) - (12\*pi) - 8;

x(1)=2.2;

steps=30;

for i=1:steps

x(i+1)=x(i)-f(x(i))/df(x(i));

end

r=x(steps+1);

e=x-r;

for i=1:steps

rat(i+1)=e(i+1)/(e(i));

end

rat(1)=0;

[x' e' rat']

>> newton

ans =

2.200000000000000 -0.266656978009135 0

2.266731061312289 -0.199925916696846 0.749749427858577

2.316811919814105 -0.149845058195030 0.749502919235051

2.354402941352251 -0.112254036656884 0.749134058934269

2.382617855552934 -0.084039122456201 0.748651228579649

2.403792995445192 -0.062863982563943 0.748032353582773

2.419682906781437 -0.046974071227698 0.747233460430509

2.431605441895691 -0.035051536113444 0.746189018693704

2.440550325333176 -0.026106652675959 0.744807662393588

2.447260727631145 -0.019396250377990 0.742961980562596

2.452294536960652 -0.014362441048483 0.740475131460484

2.456070402169740 -0.010586575839395 0.737101430297124

2.458902650360080 -0.007754327649055 0.732467963833912

2.461026393370660 -0.005630584638475 0.726121579239917

2.462620020045518 -0.004036957963617 0.716969590694165

2.463810419126810 -0.002846558882325 0.705124727079057

2.464699010440933 -0.001957967568202 0.687836664949817

2.465368237629015 -0.001288740380120 0.658203129127088

2.465869353751288 -0.000787624257847 0.611158205327563

2.466295338841810 -0.000361639167325 0.459151890920231

2.466012253208406 -0.000644724800729 1.782784772727494

2.466440855251409 -0.000216122757726 0.335217068556693

2.466656978009135 0 0

2.466656978009135 0 NaN

2.466656978009135 0 NaN

2.466656978009135 0 NaN

2.466656978009135 0 NaN

2.466656978009135 0 NaN

2.466656978009135 0 NaN

2.466656978009135 0 NaN

2.466656978009135 0 NaN

**newton.m run to find the root around 0.44:**

f=@(x) ((12\*x)\*(x^(1/2))) - ((8+12\*pi)\*x) + ((24\*x^(1/2) - 16)\*sin(x^(1/2))) + ((3\*pi^2 + 8\*pi - 24)\*x^(1/2)) - (2\*pi^2) + 16;

df=@(x) (18\*x^(1/2)) + ((-24 + 8\*pi + 3\*pi^2)/(2\*x^(1/2))) + ((12\*sin(x^(1/2)))/(x^(1/2))) + (((24\*x^(1/2) - 16)\*cos(x^(1/2)))/(2\*x^(1/2))) - (12\*pi) - 8;

x(1) = 0.3;

steps = 30;

for i=1:steps

x(i+1) = x(i) - (f(x(i))/df(x(i)));

end

r = x(steps+1);

e = x-r;

for i=1:steps

rat(i+1) = e(i+1)/e(i)^2;

end

rat(1)=0;

[x' e' rat']

>> newton

ans =

0.300000000000000 -0.144444444444450 0

0.389430898454455 -0.055013545989995 -2.636743920230344

0.434612713017002 -0.009831731427448 -3.248558772709972

0.444085493083483 -0.000358951360967 -3.713432990359696

0.444443950850732 -0.000000493593718 -3.830878826669657

0.444444444443510 -0.000000000000940 -3.856973339881727

0.444444444444450 0 0

0.444444444444450 0 NaN

0.444444444444450 0 NaN

0.444444444444450 0 NaN

0.444444444444450 0 NaN

**STEP 2**

>> nddf=@(x) 9/sqrt(x) - ((-24 + 8\*pi + 3\*pi^2)/(4\*x^(3/2))) - ((6\*sin(sqrt(x)))/x^(3/2)) - (((24\*sqrt(x) - 16)\*cos(sqrt(x)))/(4\*x^(3/2))) - (((24\*sqrt(x) - 16)\*sin(sqrt(x)))/(4\*x)) + (12\*cos(sqrt(x)))/x

nddf =

@(x)9/sqrt(x)-((-24+8\*pi+3\*pi^2)/(4\*x^(3/2)))-((6\*sin(sqrt(x)))/x^(3/2))-(((24\*sqrt(x)-16)\*cos(sqrt(x)))/(4\*x^(3/2)))-(((24\*sqrt(x)-16)\*sin(sqrt(x)))/(4\*x))+(12\*cos(sqrt(x)))/x

>> ndf=@(x) (18\*x^(1/2)) + ((-24 + 8\*pi + 3\*pi^2)/(2\*x^(1/2))) + ((12\*sin(x^(1/2)))/(x^(1/2))) + (((24\*x^(1/2) - 16)\*cos(x^(1/2)))/(2\*x^(1/2))) - (12\*pi) - 8

ndf =

@(x)(18\*x^(1/2))+((-24+8\*pi+3\*pi^2)/(2\*x^(1/2)))+((12\*sin(x^(1/2)))/(x^(1/2)))+(((24\*x^(1/2)-16)\*cos(x^(1/2)))/(2\*x^(1/2)))-(12\*pi)-8

>> abs(nddf(0.4444444444444)/2\*ndf(0.4444444444444))

ans =

0.912315780795651