
```
% Cory Wolfe
% Numerical Methods Take Home Final Question
```

```
%%a.
```

```
%i.
```

```
x = 0:1:5;
A = [2.3416,-2,0,0,0;
     -1,2.3416,-1,0,0;
      0,-1,2.3416,-1,0;
      0,0,-1,2.3416,-1;
      0,0,0,-1,2.3416];
b = [79.93;79.93;79.93;79.93;479.93];
T = A\b;
T = [T;400]
```

```
%ii.
```

```
xb = 0:.25:5
Ab = eye(20,20);
Ab = Ab.*2.02135;
Ab(1,2) = -2;
Ab(20,19) = -1;
for i=2:1:19
    Ab(i,i-1) = -1;
    Ab(i,i+1) = -1;
end
Ab
bb = 4.9956*ones(1,20);
bb(1,20) = bb(1,20)+400;
Tb = Ab\b;
Tb = [Tb;400]
```

```
%%b.
```

```
ts1 = fzero(@res,160);
[xv,yv]=ode45(@dydxn,[0,5],[ts1,0]);
plot(x,T','o',xb,Tb','o',xv,yv(:,1))
legend('Linearized, dx = 1','Linearized, dx = .25','Nonlinear
       Shooting','Location','Best')
```

```
T =
```

```
252.5252
255.6915
266.2720
287.8810
327.9001
400.0000
```

```
xb =
```

```
Columns 1 through 7
```

```
0      0.2500      0.5000      0.7500      1.0000      1.2500      1.5000
```

Columns 8 through 14

1.7500	2.0000	2.2500	2.5000	2.7500	3.0000	3.2500
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Columns 15 through 21

3.5000	3.7500	4.0000	4.2500	4.5000	4.7500	5.0000
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Ab =

Columns 1 through 7

2.0213	-2.0000	0	0	0	0	0
-1.0000	2.0213	-1.0000	0	0	0	0
0	-1.0000	2.0213	-1.0000	0	0	0
0	0	-1.0000	2.0213	-1.0000	0	0
0	0	0	-1.0000	2.0213	-1.0000	0
0	0	0	0	-1.0000	2.0213	-1.0000
0	0	0	0	0	-1.0000	2.0213
0	0	0	0	0	0	-1.0000
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0

Columns 8 through 14

0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
-1.0000	0	0	0	0	0	0
2.0213	-1.0000	0	0	0	0	0
-1.0000	2.0213	-1.0000	0	0	0	0
0	-1.0000	2.0213	-1.0000	0	0	0
0	0	-1.0000	2.0213	-1.0000	0	0
0	0	0	-1.0000	2.0213	-1.0000	0
0	0	0	0	-1.0000	2.0213	-1.0000
0	0	0	0	0	-1.0000	2.0213
0	0	0	0	0	0	-1.0000
0	0	0	0	0	0	0
0	0	0	0	0	0	0

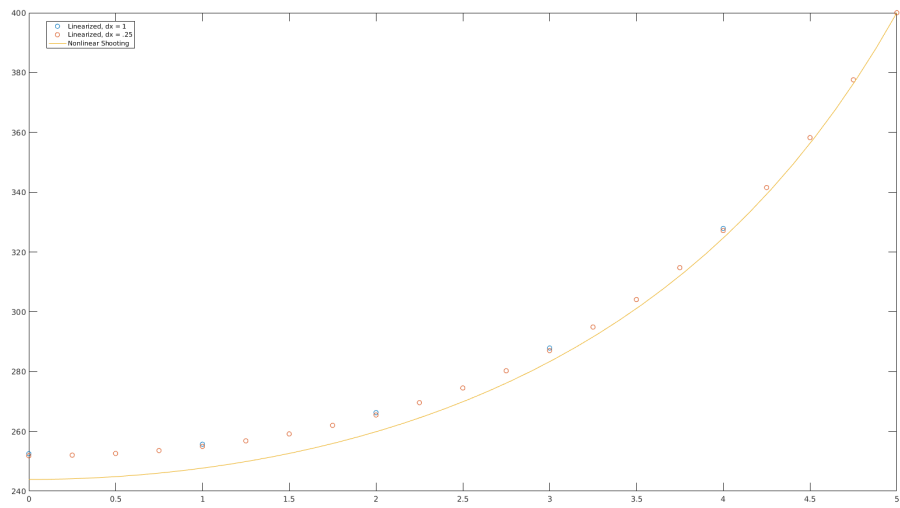
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0

Columns 15 through 20

0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
-1.0000	0	0	0	0	0
2.0213	-1.0000	0	0	0	0
-1.0000	2.0213	-1.0000	0	0	0
0	-1.0000	2.0213	-1.0000	0	0
0	0	-1.0000	2.0213	-1.0000	0
0	0	0	-1.0000	2.0213	-1.0000
0	0	0	0	-1.0000	2.0213

Tb =

251.8462
 252.0369
 252.6129
 253.5867
 254.9789
 256.8193
 259.1472
 262.0123
 265.4757
 269.6115
 274.5078
 280.2693
 287.0190
 294.9009
 304.0833
 314.7624
 327.1660
 341.5590
 358.2486
 377.5913
 400.0000



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