CSC 349A

ASSIGNMENT 1

Q1.

a)

function Euler(m,c,g,t0,v0,tn,n)

% print headings and initial conditions

fprintf('values of t \n')

fprintf('%8.3f',t0)

% compute step size h

h=(tn-t0)/n;

% set t,v to the initial values

t=t0;

v=v0;

% compute v(t) over n time steps using Euler’s method

for i=1:n

t=t+h;

fprintf('%8.3f',t)

end

fprintf('\nvalues of v \n')

fprintf('%19.4f', v0)

for i=1:n

v= v+(g-c/m\*v)\*h;

fprintf('%19.4f', v)

end

b)

>> Euler(73.5, 13.1, 9.81, 0, 0, 16, 80 )

values of t approximations v(t)

0.000 0.0000

0.200 1.9620

0.400 3.8541

0.600 5.6787

0.800 7.4383

1.000 9.1351

1.200 10.7715

1.400 12.3495

1.600 13.8713

1.800 15.3388

2.000 16.7541

2.200 18.1188

2.400 19.4350

2.600 20.7042

2.800 21.9282

3.000 23.1085

3.200 24.2468

3.400 25.3445

3.600 26.4030

3.800 27.4239

4.000 28.4083

4.200 29.3577

4.400 30.2732

4.600 31.1560

4.800 32.0074

5.000 32.8285

5.200 33.6203

5.400 34.3838

5.600 35.1202

5.800 35.8303

6.000 36.5151

6.200 37.1754

6.400 37.8123

6.600 38.4264

6.800 39.0187

7.000 39.5898

7.200 40.1406

7.400 40.6717

7.600 41.1839

7.800 41.6779

8.000 42.1542

8.200 42.6136

8.400 43.0565

8.600 43.4837

8.800 43.8957

9.000 44.2930

9.200 44.6761

9.400 45.0456

9.600 45.4019

9.800 45.7455

10.000 46.0768

10.200 46.3963

10.400 46.7045

10.600 47.0016

10.800 47.2882

11.000 47.5646

11.200 47.8311

11.400 48.0881

11.600 48.3359

11.800 48.5749

12.000 48.8054

12.200 49.0277

12.400 49.2420

12.600 49.4487

12.800 49.6481

13.000 49.8403

13.200 50.0257

13.400 50.2044

13.600 50.3768

13.800 50.5431

14.000 50.7034

14.200 50.8580

14.400 51.0071

14.600 51.1509

14.800 51.2896

15.000 51.4233

15.200 51.5523

15.400 51.6766

15.600 51.7965

15.800 51.9122

16.000 52.0237

c)

function Q1c(m,c,g,t0,v0,tn,n)

% print headings and initial conditions

fprintf('values of t approximations v(t)\n')

fprintf('%8.3f',t0),fprintf('%19.4f\n',v0)

% compute step size h

h=(tn-t0)/n;

% set t,v to the initial values

t=t0;

v=v0;

% compute v(t) over n time steps using Euler’s method

for i=1:n

v=(g\*m/c)\*(1-exp(-c\*t/m))

t=t+h;

fprintf('%8.3f',t),fprintf('%19.4f\n',v)

end

>> Q1c(73.5, 13.1, 9.81, 0, 0, 16, 80 )

values of t approximations v(t)

0.000 0.0000

v =

0

0.200 0.0000

v =

1.9274

0.400 1.9274

v =

3.7874

0.600 3.7874

v =

5.5822

0.800 5.5822

v =

7.3142

1.000 7.3142

v =

8.9855

1.200 8.9855

v =

10.5983

1.400 10.5983

v =

12.1546

1.600 12.1546

v =

13.6564

1.800 13.6564

v =

15.1056

2.000 15.1056

v =

16.5041

2.200 16.5041

v =

17.8536

2.400 17.8536

v =

19.1558

2.600 19.1558

v =

20.4124

2.800 20.4124

v =

21.6251

3.000 21.6251

v =

22.7952

3.200 22.7952

v =

23.9244

3.400 23.9244

v =

25.0141

3.600 25.0141

v =

26.0656

3.800 26.0656

v =

27.0802

4.000 27.0802

v =

28.0594

4.200 28.0594

v =

29.0042

4.400 29.0042

v =

29.9160

4.600 29.9160

v =

30.7958

4.800 30.7958

v =

31.6448

5.000 31.6448

v =

32.4641

5.200 32.4641

v =

33.2547

5.400 33.2547

v =

34.0176

5.600 34.0176

v =

34.7538

5.800 34.7538

v =

35.4643

6.000 35.4643

v =

36.1498

6.200 36.1498

v =

36.8113

6.400 36.8113

v =

37.4497

6.600 37.4497

v =

38.0657

6.800 38.0657

v =

38.6602

7.000 38.6602

v =

39.2338

7.200 39.2338

v =

39.7873

7.400 39.7873

v =

40.3215

7.600 40.3215

v =

40.8369

7.800 40.8369

v =

41.3343

8.000 41.3343

v =

41.8143

8.200 41.8143

v =

42.2775

8.400 42.2775

v =

42.7244

8.600 42.7244

v =

43.1557

8.800 43.1557

v =

43.5719

9.000 43.5719

v =

43.9736

9.200 43.9736

v =

44.3611

9.400 44.3611

v =

44.7351

9.600 44.7351

v =

45.0960

9.800 45.0960

v =

45.4442

10.000 45.4442

v =

45.7803

10.200 45.7803

v =

46.1046

10.400 46.1046

v =

46.4175

10.600 46.4175

v =

46.7195

10.800 46.7195

v =

47.0109

11.000 47.0109

v =

47.2921

11.200 47.2921

v =

47.5634

11.400 47.5634

v =

47.8253

11.600 47.8253

v =

48.0780

11.800 48.0780

v =

48.3218

12.000 48.3218

v =

48.5571

12.200 48.5571

v =

48.7841

12.400 48.7841

v =

49.0032

12.600 49.0032

v =

49.2147

12.800 49.2147

v =

49.4187

13.000 49.4187

v =

49.6156

13.200 49.6156

v =

49.8055

13.400 49.8055

v =

49.9889

13.600 49.9889

v =

50.1658

13.800 50.1658

v =

50.3365

14.000 50.3365

v =

50.5012

14.200 50.5012

v =

50.6602

14.400 50.6602

v =

50.8136

14.600 50.8136

v =

50.9616

14.800 50.9616

v =

51.1045

15.000 51.1045

v =

51.2423

15.200 51.2423

v =

51.3754

15.400 51.3754

v =

51.5037

15.600 51.5037

v =

51.6276

15.800 51.6276

v =

51.7471

16.000 51.7471

d)