

AJAIYEGBA OYINKAN ELOHO

16/ENG06/006

MECHANICAL ENGINEERING

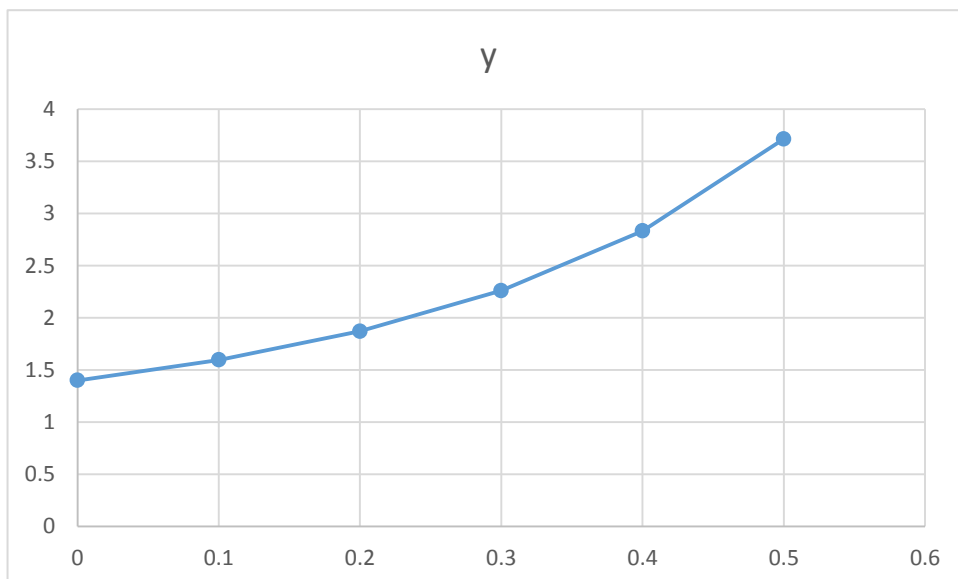
ENG 382 ASSIGNMENT 5

SOLUTION

QUESTION 1

h	t	y
0.1	0	1.4
	0.1	1.596
	0.2	1.870722
	0.3	2.260682
	0.4	2.83175
	0.5	3.71363

h	t	y
0.1	0	1.4
	0.1	1.596
	0.2	1.870722
	0.3	2.260682
	0.4	2.83175
	0.5	3.71363



1B.

```
commandwindow
clear
clc
format short g
h=0.1
y=1.4
t=0
for i=1:inf
    iter(i+1)=i;
    t(i+1)=t(i)+h;
    y(i+1)=y(i)+h*(2*t(i)+y(i)^2)
    if t(i+1)==0.5
        break
    end
end
iter'
t'
y'
tableau= table(iter', t' ,y')
plot(t,y,'r')
xlabel('time')
ylabel('dynamic response')
grid on
grid minor
axis tight
```

h =

0.1

y =

1.4

t =

0

Warning: Too many FOR loop iterations. Stopping after 9223372036854775806 iterations.

> In Eulerassignment (line 8)

y =

1.4 1.596

y =

1.4 1.596 1.8707

y =

1.4 1.596 1.8707 2.2607

y =

1.4 1.596 1.8707 2.2607 2.8317

y =

1.4 1.596 1.8707 2.2607 2.8317 3.7136

ans =

0

1

2

3

4

5

ans =

0

0.1

0.2

0.3

0.4

0.5

ans =

1.4

1.596

1.8707

2.2607

2.8317

3.7136

tableau =

6×3 table

Var1 Var2 Var3

0 0 1.4

1 0.1 1.596

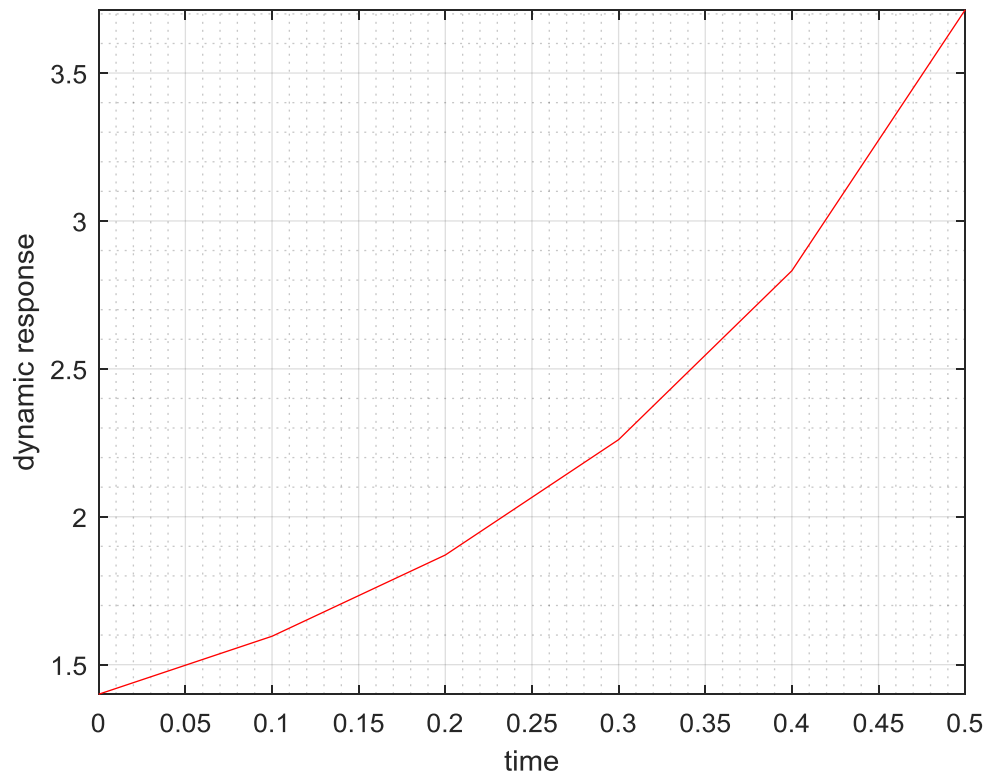
2 0.2 1.8707

3 0.3 2.2607

4 0.4 2.8317

5 0.5 3.7136

>>



QUESTION 2

```
function dQdt= Oyinkan(t,Q)
dQdt (1)=(-0.03*Q(1))+(0.005*Q(2))+1;
dQdt (2)=(0.03*Q(1)-(0.018*Q(2))+(0.0075*Q(3)));
dQdt (3)=(0.013*Q(2))-(0.0325*Q(3));
dQdt=dQdt'
```

```
commandwindow
clear
clc
close all
[t,y]= ode45('Oyinkan',[0 1200],[0 0 0])
tableau= table(t,y)
plot(t,y)
xlabel('t')
ylabel('y')
grid on
grid minor
axis tight
plot(t,y(:,1),'r-')
hold on
plot (t,y(:,2),'b-')
```

```
hold on
plot (t,y(:,3),'g-')
grid on
grid minor
axis tight
legend ('y_1','y_2','y_3')
```

dQdt =

```
1
0
0
```

dQdt =

```
1
1.2057e-06
0
```

dQdt =

```
1
1.8086e-06
7.0869e-13
```

dQdt =

```
1
4.8228e-06
5.0395e-12
```

dQdt =

```
0.99999
5.3587e-06
6.2216e-12
```

dQdt =

```
0.99999
6.0285e-06
7.8743e-12
```

dQdt =

0.99999
6.0285e-06
7.8743e-12

dQdt =

0.99999
1.2057e-05
2.3623e-11

dQdt =

0.99998
1.5071e-05
4.9214e-11

dQdt =

0.99997
3.0142e-05
1.9685e-10

dQdt =

0.99997
3.2821e-05
2.334e-10

dQdt =

0.99996
3.617e-05
2.8346e-10

dQdt =

0.99996

3.617e-05
2.8347e-10

dQdt =

0.99993
6.6311e-05
7.5591e-10

dQdt =

0.99992
8.138e-05
1.435e-09

dQdt =

0.99984
0.00015672
5.322e-09

dQdt =

0.99983
0.00017012
6.27e-09

dQdt =

0.99981
0.00018686
7.5651e-09

dQdt =

0.99981
0.00018686
7.566e-09

dQdt =

0.99966
0.00033752
1.9768e-08

dQdt =

0.99959
0.00041282
3.6937e-08

dQdt =

0.99921
0.00078924
1.35e-07

dQdt =

0.99914
0.00085613
1.5879e-07

dQdt =

0.99906
0.00093974
1.9136e-07

dQdt =

0.99906
0.00093974
1.9147e-07

dQdt =

0.99831
0.0016922
4.9818e-07

dQdt =

0.99793
0.0020674
9.2767e-07

dQdt =

0.99605
0.0039422
3.372e-06

dQdt =

0.99572
0.004275
3.9572e-06

dQdt =

0.9953
0.0046906
4.7695e-06

dQdt =

0.9953
0.0046906
4.7829e-06

dQdt =

0.99156
0.0084301
1.2422e-05

dQdt =

0.9897
0.010275

2.3075e-05

dQdt =

0.98045
0.019471
8.2701e-05

dQdt =

0.97881
0.021093
9.6027e-05

dQdt =

0.97677
0.023112
0.00011595

dQdt =

0.97677
0.023109
0.00011764

dQdt =

0.95955
0.040155
0.00029264

dQdt =

0.95134
0.048132
0.00052347

dQdt =

0.91057
0.087651
0.0017136

dQdt =

0.90339
0.094609
0.0018787

dQdt =

0.89473
0.10286
0.002284

dQdt =

0.89494
0.10252
0.0024621

dQdt =

0.87546
0.12103
0.0033887

dQdt =

0.86628
0.12952
0.0040273

dQdt =

0.82075
0.17159
0.0072102

dQdt =

0.8127
0.17906
0.0076598

dQdt =

0.80313
0.18767
0.0085393

dQdt =

0.80352
0.18706
0.0088404

dQdt =

0.7773
0.21061
0.011267

dQdt =

0.76534
0.22086
0.01277

dQdt =

0.70597
0.27174
0.020019

dQdt =

0.69518
0.28128
0.020829

dQdt =

0.68312
0.2911
0.022721

dQdt =

0.68437
0.28919
0.023629

dQdt =

0.65379
0.31402
0.028421

dQdt =

0.64038
0.32405
0.031118

dQdt =

0.57348
0.3744
0.043773

dQdt =

0.56056
0.38514
0.044854

dQdt =

0.54752

0.394
0.047942

dQdt =

0.55047
0.38954
0.049867

dQdt =

0.51882
0.41101
0.05735

dQdt =

0.50558
0.41861
0.061179

dQdt =

0.43863
0.45834
0.07874

dQdt =

0.4242
0.46948
0.07984

dQdt =

0.41181
0.47532
0.083757

dQdt =

0.41751
0.46695
0.086812

dQdt =

0.38814
0.4807
0.096178

dQdt =

0.37653
0.48415
0.10045

dQdt =

0.3163
0.5053
0.11977

dQdt =

0.30089
0.51617
0.12071

dQdt =

0.29039
0.51774
0.12442

dQdt =

0.29972
0.50457
0.12793

dQdt =

0.2751
0.50787
0.13707

dQdt =

0.26602
0.5064
0.14055

dQdt =

0.21661
0.5054
0.1564

dQdt =

0.20052
0.51551
0.15746

dQdt =

0.19237
0.51277
0.15957

dQdt =

0.20581
0.49486
0.16172

dQdt =

0.18688
0.48708

0.16774

dQdt =

0.18046

0.48099

0.16905

dQdt =

0.14242

0.45883

0.17611

dQdt =

0.1256

0.46778

0.17838

dQdt =

0.1194

0.46182

0.17779

dQdt =

0.13716

0.44015

0.17562

dQdt =

0.12332

0.42214

0.17572

dQdt =

0.11905
0.4124
0.17384

dQdt =

0.089938
0.37293
0.16914

dQdt =

0.071699
0.38028
0.17501

dQdt =

0.066232
0.373
0.17176

dQdt =

0.089054
0.34906
0.16091

dQdt =

0.080577
0.32705
0.15458

dQdt =

0.077824
0.31702
0.15058

dQdt =

0.05925
0.27134
0.13613

dQdt =

0.047526
0.26994
0.14172

dQdt =

0.043466
0.26241
0.13825

dQdt =

0.058419
0.2515
0.12512

dQdt =

0.052659
0.23014
0.11585

dQdt =

0.050643
0.22132
0.11152

dQdt =

0.038086
0.1782
0.093159

dQdt =

0.031259
0.17156
0.094862

dQdt =

0.028342
0.16477
0.091949

dQdt =

0.036778
0.16359
0.083977

dQdt =

0.032639
0.14602
0.075236

dQdt =

0.031161
0.1393
0.071773

dQdt =

0.022512
0.10474
0.054789

dQdt =

0.018517

0.096627
0.052043

dQdt =

0.016594
0.091512
0.049455

dQdt =

0.021273
0.095315
0.049416

dQdt =

0.01787
0.080429
0.041689

dQdt =

0.016824
0.075542
0.03919

dQdt =

0.0097406
0.04792
0.024048

dQdt =

0.0048241
0.038456
0.016224

dQdt =

0.0025435
0.036542
0.012458

dQdt =

0.0099605
0.042978
0.023124

dQdt =

0.0081348
0.036422
0.018929

dQdt =

0.0077602
0.033922
0.018083

dQdt =

0.0017432
0.026745
0.0034275

dQdt =

-0.0089767
0.040239
-0.024278

dQdt =

-0.01631
0.053289
-0.044755

dQdt =

0.0060732
0.015403
0.015351

dQdt =

0.0087605
0.038669
0.020367

dQdt =

0.008393
0.03685
0.019529

dQdt =

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0.029397
0.012584

dQdt =

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0.031376
0.0056887

dQdt =

0.0015176
0.031798
0.0023576

dQdt =

0.0058061
0.025257

0.013634

dQdt =

0.0051212
0.022709
0.011993

dQdt =

0.0049044
0.021644
0.011498

dQdt =

0.0032678
0.017174
0.0073871

dQdt =

0.0018598
0.018098
0.0033282

dQdt =

0.0011971
0.018246
0.0014114

dQdt =

0.0033963
0.014839
0.0080006

dQdt =

0.0029174
0.01302
0.0068402

dQdt =

0.0027805
0.012298
0.0065336

dQdt =

0.0015538
0.0094361
0.003323

dQdt =

0.00017478
0.010685
-0.00087092

dQdt =

-0.00056991
0.011517
-0.0031734

dQdt =

0.0018613
0.0076078
0.0044628

dQdt =

0.0015246
0.0067067
0.0035899

dQdt =

0.0014753
0.006247
0.0035079

dQdt =

0.00014391
0.0060901
-0.0004229

dQdt =

-0.0025458
0.011094
-0.0091128

dQdt =

-0.0042095
0.014463
-0.014535

dQdt =

0.0012034
0.0031002
0.0031447

dQdt =

0.00085733
0.0031654
0.0021049

dQdt =

0.00088666
0.0028323
0.0022397

dQdt =

-0.0011007
0.0060051
-0.0041325

dQdt =

-0.0060718
0.017077
-0.020519

dQdt =

-0.008759
0.02309
-0.029384

dQdt =

0.00093985
0.00096909
0.0026642

dQdt =

0.00061725
0.0013937
0.001642

dQdt =

0.00063937
0.0012176
0.0017331

dQdt =

-0.00087471

0.0040836
-0.0031895

dQdt =

-0.0043933
0.012083
-0.01482

dQdt =

-0.0058589
0.015377
-0.01966

dQdt =

0.00048998
0.00074534
0.0013551

dQdt =

0.00034366
0.00089798
0.00089703

dQdt =

0.0003478
0.00081569
0.0009211

dQdt =

-0.00028337
0.0019046
-0.0011162

dQdt =

-0.0016825
0.005057
-0.0057376

dQdt =

-0.0022393
0.0062862
-0.007573

dQdt =

0.00024788
0.00057004
0.0006581

dQdt =

0.00017566
0.00060329
0.00043799

dQdt =

0.00018088
0.00054169
0.00046232

dQdt =

-0.00020368
0.0011701
-0.00077403

dQdt =

-0.0011368
0.0032573
-0.0038542

dQdt =

-0.0016002
0.0042912
-0.0053834

dQdt =

0.0001691
0.00024437
0.00046953

dQdt =

9.7213e-05
0.00032269
0.00024399

dQdt =

0.00011478
0.00025144
0.00030652

dQdt =

-0.00045381
0.001401
-0.0015529

dQdt =

-0.0020459
0.0050352
-0.0068186

dQdt =

-0.0030368
0.0073109

-0.010098

dQdt =

0.0002536
-0.00027126
0.00079498

dQdt =

0.00011868
6.4676e-06
0.00035305

dQdt =

0.00014327
-6.3966e-05
0.0004364

dQdt =

-0.00065038
0.0017089
-0.0021831

dQdt =

-0.002687
0.0064191
-0.0089279

dQdt =

-0.0036375
0.0086153
-0.012075

dQdt =

0.0001762
-0.00022791
0.00055797

t =

0
5.0238e-05
0.00010048
0.00015071
0.00020095
0.00045214
0.00070333
0.00095452
0.0012057
0.0024616
0.0037176
0.0049735
0.0062295
0.012509
0.018789
0.025069
0.031348
0.062747
0.094146
0.12554
0.15694
0.31394
0.47093
0.62792
0.78491
1.5225
2.2601
2.9977
3.7352
4.6599
5.5846
6.5093
7.434
8.8487
10.263
11.678
13.093
15.095
17.097
19.1

21.102
23.818
26.535
29.251
31.968
35.571
39.174
42.777
46.381
51.138
55.896
60.654
65.412
71.808
78.205
84.602
90.998
100.04
109.08
118.11
127.15
138.59
150.03
161.47
172.91
187.45
201.99
216.54
231.08
249.21
267.35
285.48
303.61
329.93
356.26
382.58
408.91
426.78
444.66
462.53
480.4
498.28
516.15
534.02
551.9
573.51
595.12

616.73
638.34
661.99
685.64
709.29
732.94
753.94
774.93
795.93
816.93
834.2
851.47
868.74
886.01
902.68
919.35
936.01
952.68
972.37
992.05
1011.7
1031.4
1054.7
1078.1
1101.4
1124.7
1143.6
1162.4
1181.2
1200

y =

0	0	0
5.0238e-05	3.7857e-11	8.2414e-18
0.00010048	1.5143e-10	6.5931e-17
0.00015071	3.4072e-10	2.2252e-16
0.00020095	6.0572e-10	5.2745e-16
0.00045214	3.0664e-09	6.008e-15
0.00070332	7.42e-09	2.2614e-14
0.0009545	1.3666e-08	5.6527e-14
0.0012057	2.1805e-08	1.1393e-13
0.0024616	9.0892e-08	9.6955e-13
0.0037174	2.073e-07	3.3394e-12
0.0049732	3.7101e-07	7.9959e-12
0.0062289	5.8204e-07	1.5711e-11

0.012507	2.3467e-06	1.272e-10
0.018784	5.2938e-06	4.3098e-10
0.025059	9.4228e-06	1.0235e-09
0.031334	1.4733e-05	2.0012e-09
0.062688	5.8998e-05	1.6038e-08
0.094013	0.00013275	5.4136e-08
0.12531	0.00023595	1.2829e-07
0.15657	0.00036854	2.5048e-07
0.31246	0.0014709	1.9985e-06
0.46762	0.0033017	6.7247e-06
0.62205	0.0058552	1.5891e-05
0.77576	0.0091262	3.0941e-05
1.4883	0.033936	0.00022264
2.1854	0.073913	0.00071735
2.8675	0.12852	0.0016489
3.5348	0.19725	0.0031434
4.3512	0.30258	0.0059928
5.1458	0.42836	0.010128
5.9193	0.57366	0.015746
6.6723	0.7376	0.023031
7.7862	1.0226	0.037777
8.8559	1.3463	0.057336
9.8835	1.706	0.08216
10.871	2.0992	0.11264
12.204	2.7082	0.1661
13.465	3.3731	0.23225
14.66	4.0879	0.31162
15.792	4.8473	0.40458
17.235	5.94	0.55283
18.58	7.0945	0.72656
19.835	8.301	0.92548
21.008	9.5507	1.1491
22.449	11.261	1.4828
23.772	13.018	1.8562
24.989	14.808	2.2667
26.113	16.619	2.7114
27.469	19.026	3.3463
28.699	21.434	4.0282
29.817	23.83	4.7497
30.84	26.201	5.5044
32.086	29.331	6.5609
33.204	32.383	7.6511
34.213	35.348	8.7617
35.13	38.216	9.8826
36.3	42.088	11.467
37.34	45.753	13.031
38.269	49.216	14.559

39.111	52.476	16.039
40.075	56.311	17.832
40.937	59.85	19.524
41.708	63.116	21.114
42.406	66.121	22.599
43.209	69.588	24.333
43.92	72.705	25.908
44.549	75.509	27.337
45.112	78.025	28.626
45.736	80.799	30.053
46.278	83.225	31.304
46.748	85.347	32.4
47.158	87.201	33.36
47.672	89.471	34.551
48.091	91.344	35.525
48.422	92.899	36.308
48.697	94.173	36.958
48.865	94.889	37.349
49.009	95.521	37.686
49.13	96.086	37.965
49.236	96.579	38.212
49.334	97	38.443
49.419	97.372	38.641
49.49	97.703	38.806
49.552	97.992	38.951
49.622	98.284	39.116
49.679	98.536	39.252
49.724	98.761	39.354
49.763	98.95	39.443
49.809	99.102	39.559
49.843	99.239	39.641
49.86	99.383	39.669
49.876	99.497	39.702
49.907	99.54	39.788
49.926	99.593	39.838
49.925	99.68	39.821
49.927	99.748	39.817
49.944	99.759	39.867
49.955	99.778	39.897
49.956	99.815	39.895
49.958	99.845	39.896
49.966	99.855	39.92
49.972	99.868	39.935
49.974	99.887	39.938
49.976	99.903	39.941
49.981	99.911	39.957
49.985	99.921	39.966

49.985	99.936	39.965
49.986	99.948	39.965
49.993	99.945	39.986
49.996	99.949	39.995
49.991	99.97	39.978
49.989	99.983	39.969
49.995	99.974	39.989
49.998	99.972	39.998
49.995	99.984	39.987
49.993	99.992	39.98

tableau =

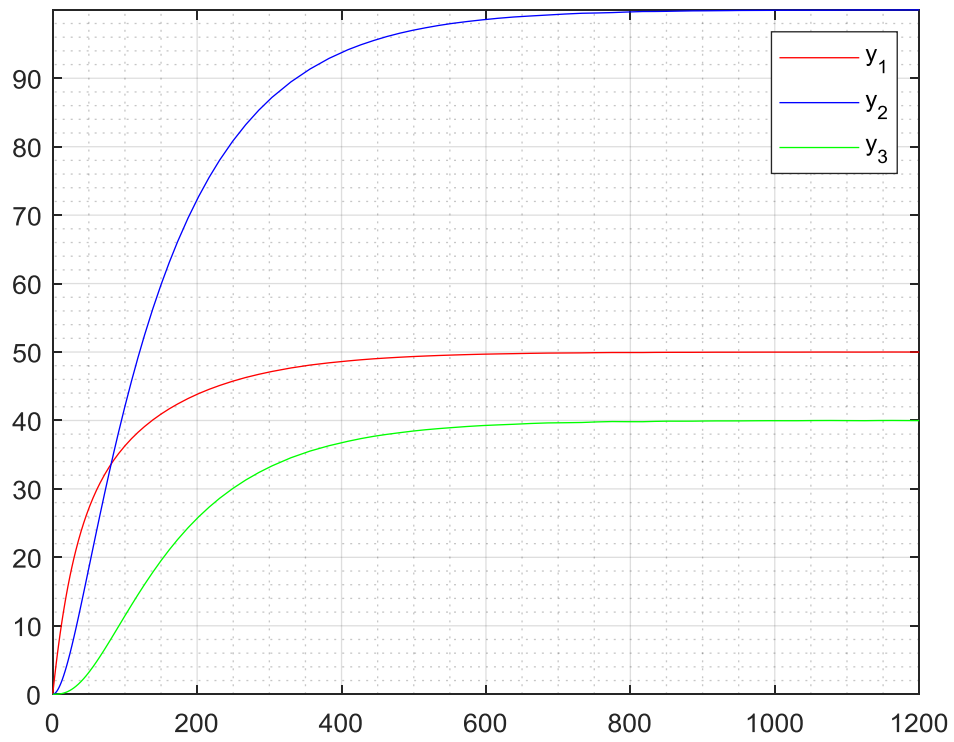
117x2 table

t		y	
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5.0238e-05	5.0238e-05	3.7857e-11	8.2414e-18
0.00010048	0.00010048	1.5143e-10	6.5931e-17
0.00015071	0.00015071	3.4072e-10	2.2252e-16
0.00020095	0.00020095	6.0572e-10	5.2745e-16
0.00045214	0.00045214	3.0664e-09	6.008e-15
0.00070333	0.00070332	7.42e-09	2.2614e-14
0.00095452	0.0009545	1.3666e-08	5.6527e-14
0.0012057	0.0012057	2.1805e-08	1.1393e-13
0.0024616	0.0024616	9.0892e-08	9.6955e-13
0.0037176	0.0037174	2.073e-07	3.3394e-12
0.0049735	0.0049732	3.7101e-07	7.9959e-12
0.0062295	0.0062289	5.8204e-07	1.5711e-11
0.012509	0.012507	2.3467e-06	1.272e-10
0.018789	0.018784	5.2938e-06	4.3098e-10
0.025069	0.025059	9.4228e-06	1.0235e-09
0.031348	0.031334	1.4733e-05	2.0012e-09
0.062747	0.062688	5.8998e-05	1.6038e-08
0.094146	0.094013	0.00013275	5.4136e-08
0.12554	0.12531	0.00023595	1.2829e-07
0.15694	0.15657	0.00036854	2.5048e-07
0.31394	0.31246	0.0014709	1.9985e-06
0.47093	0.46762	0.0033017	6.7247e-06
0.62792	0.62205	0.0058552	1.5891e-05
0.78491	0.77576	0.0091262	3.0941e-05
1.5225	1.4883	0.033936	0.00022264
2.2601	2.1854	0.073913	0.00071735
2.9977	2.8675	0.12852	0.0016489

3.7352	3.5348	0.19725	0.0031434
4.6599	4.3512	0.30258	0.0059928
5.5846	5.1458	0.42836	0.010128
6.5093	5.9193	0.57366	0.015746
7.434	6.6723	0.7376	0.023031
8.8487	7.7862	1.0226	0.037777
10.263	8.8559	1.3463	0.057336
11.678	9.8835	1.706	0.08216
13.093	10.871	2.0992	0.11264
15.095	12.204	2.7082	0.1661
17.097	13.465	3.3731	0.23225
19.1	14.66	4.0879	0.31162
21.102	15.792	4.8473	0.40458
23.818	17.235	5.94	0.55283
26.535	18.58	7.0945	0.72656
29.251	19.835	8.301	0.92548
31.968	21.008	9.5507	1.1491
35.571	22.449	11.261	1.4828
39.174	23.772	13.018	1.8562
42.777	24.989	14.808	2.2667
46.381	26.113	16.619	2.7114
51.138	27.469	19.026	3.3463
55.896	28.699	21.434	4.0282
60.654	29.817	23.83	4.7497
65.412	30.84	26.201	5.5044
71.808	32.086	29.331	6.5609
78.205	33.204	32.383	7.6511
84.602	34.213	35.348	8.7617
90.998	35.13	38.216	9.8826
100.04	36.3	42.088	11.467
109.08	37.34	45.753	13.031
118.11	38.269	49.216	14.559
127.15	39.111	52.476	16.039
138.59	40.075	56.311	17.832
150.03	40.937	59.85	19.524
161.47	41.708	63.116	21.114
172.91	42.406	66.121	22.599
187.45	43.209	69.588	24.333
201.99	43.92	72.705	25.908
216.54	44.549	75.509	27.337
231.08	45.112	78.025	28.626
249.21	45.736	80.799	30.053
267.35	46.278	83.225	31.304
285.48	46.748	85.347	32.4
303.61	47.158	87.201	33.36
329.93	47.672	89.471	34.551
356.26	48.091	91.344	35.525

382.58	48.422	92.899	36.308
408.91	48.697	94.173	36.958
426.78	48.865	94.889	37.349
444.66	49.009	95.521	37.686
462.53	49.13	96.086	37.965
480.4	49.236	96.579	38.212
498.28	49.334	97	38.443
516.15	49.419	97.372	38.641
534.02	49.49	97.703	38.806
551.9	49.552	97.992	38.951
573.51	49.622	98.284	39.116
595.12	49.679	98.536	39.252
616.73	49.724	98.761	39.354
638.34	49.763	98.95	39.443
661.99	49.809	99.102	39.559
685.64	49.843	99.239	39.641
709.29	49.86	99.383	39.669
732.94	49.876	99.497	39.702
753.94	49.907	99.54	39.788
774.93	49.926	99.593	39.838
795.93	49.925	99.68	39.821
816.93	49.927	99.748	39.817
834.2	49.944	99.759	39.867
851.47	49.955	99.778	39.897
868.74	49.956	99.815	39.895
886.01	49.958	99.845	39.896
902.68	49.966	99.855	39.92
919.35	49.972	99.868	39.935
936.01	49.974	99.887	39.938
952.68	49.976	99.903	39.941
972.37	49.981	99.911	39.957
992.05	49.985	99.921	39.966
1011.7	49.985	99.936	39.965
1031.4	49.986	99.948	39.965
1054.7	49.993	99.945	39.986
1078.1	49.996	99.949	39.995
1101.4	49.991	99.97	39.978
1124.7	49.989	99.983	39.969
1143.6	49.995	99.974	39.989
1162.4	49.998	99.972	39.998
1181.2	49.995	99.984	39.987
1200	49.993	99.992	39.98

>>



STEADY STATE VALUES

$Q_1=100$

$Q_2=50$

$Q_3=40$