

t (min)	V (litre)
0	200.0038
1	239.0165
2	318.1907
3	311.4336
4	303.601
5	376.9594
6	393.9593
7	436.2495
8	511.0566
9	489.8975
10	484.0395
11	538.4402
12	534.9268
13	582.3634
14	651.2431
15	622.1068
16	622.6706
17	658.0681
18	637.9229
19	690.6072
20	751.3315
21	720.0498
22	729.9392
23	746.6906
24	714.1865
25	770.7962
26	820.9421
27	792.6078
28	813.2194
29	812.3438
30	772.0466
31	830.2016
32	867.563
33	846.3601
34	877.6703
35	860.9808
36	817.5649
37	874.2103
38	897.1359
39	886.1807
40	926.8944
41	897.0121
42	855.0207
43	906.8127
44	914.4578
45	915.6806
46	963.4425

47 923.7047
48 887.2864
49 930.9651
50 923.448
51 937.5347
52 989.1981
53 943.479
54 916.1304
55 948.8577
56 927.3157
57 953.7245
58 1005.661
59 958.1282
60 942.4688
61 962.1129
62 928.6612
63 965.7183
64 1014.153
65 968.9806
66 966.5845
67 971.9325
68 929.5315
69 974.6035
70 1015.944
71 977.0203
72 988.3204
73 979.2071
74 931.4534
75 981.1858
76 1012.338
77 982.9762
78 1007.252
79 984.5962
80 935.4561
81 986.0621
82 1004.691
83 987.3885
84 1022.838
85 988.5886
86 942.0967
87 989.6745
88 994.4053
89 990.6571
90 1034.556
91 991.5462
92 951.4952
93 992.3507
94 982.8867

95 993.0786
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99 994.3333
100 971.4881
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102 1044.978
103 995.3605
104 977.1707
105 995.802
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108 1043.537
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110 992.0225
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113 997.186
114 1038.011
115 997.4538
116 1006.951
117 997.6961
118 949.2981
119 997.9153
120 1028.999
121 998.1137
122 1020.912
123 998.2932
124 948.4798
125 998.4556
126 1017.339
127 998.6026
128 1032.901
129 998.7356
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131 998.8559
132 1004.046
133 998.9648
134 1042.041
135 999.0633
136 958.1556
137 999.1524
138 990.2451
139 999.2331
140 1047.665
141 999.3061
142 968.0039

143 999.3721
144 977.0835
145 999.4319
146 1049.366
147 999.4859
148 980.2883
149 999.5348
150 965.6452
151 999.5791
152 1047.043
153 999.6192
154 994.0593
155 999.6554
156 956.8681
157 999.6882
158 1040.905
159 999.7179
160 1008.242
161 999.7447
162 951.4708
163 999.769
164 1031.456
165 999.791
166 1021.722
167 999.8109
168 949.8978
169 999.8289
170 1019.465
171 999.8452
172 1033.437
173 999.8599
174 952.2852
175 999.8732
176 1005.895
177 999.8853
178 1042.464
179 999.8962
180 958.4508
181 999.9061
182 991.8354
183 999.915
184 1048.09
185 999.9231
186 967.9093
187 999.9304
188 978.4105
189 999.937
190 1049.871

191 999.943
192 979.9116
193 999.9485
194 966.6941
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197 999.9578
198 993.5049
199 999.9618
200 957.6225
201 999.9655
202 1041.662
203 999.9687
204 1007.609
205 999.9717
206 951.9205
207 999.9744
208 1032.331
209 999.9768
210 1021.101
211 999.979
212 950.0438
213 999.981
214 1020.42
215 999.9828
216 1032.909
217 999.9845
218 952.1432
219 999.986
220 1006.88
221 999.9873
222 1042.093
223 999.9885
224 958.0524
225 999.9896
226 992.7887
227 999.9906
228 1047.921
229 999.9915
230 967.3011
231 999.9923
232 979.2706
233 999.993
234 1049.931
235 999.9937
236 979.1533
237 999.9943
238 967.4025

239 999.9948
240 1047.962
241 999.9953
242 992.6651
243 999.9958
244 958.1302
245 999.9962
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248 1006.76
249 999.9969
250 952.1926
251 999.9972
252 1033.021
253 999.9974
254 1020.317
255 999.9977
256 950.0627
257 999.9979
258 1021.24
259 999.9981
260 1032.254
261 999.9983
262 951.9105
263 999.9984
264 1007.766
265 999.9986
266 1041.622
267 999.9987
268 957.5887
269 999.9988
270 993.6734
271 999.999
272 1047.674
273 999.9991
274 966.6452
275 999.9991
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277 999.9992
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281 999.9994
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296 1033.681
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 492 1046.174
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 494 963.4913
 495 1000
 496 984.2116
 497 1000
 498 1049.649
 499 1000
 500 974.4656

$(t/120)^{3/2}$
 a. $\frac{dm}{dt} = 50(1 + \sin(t)) - \frac{3m}{2t+120}$
 b. $\frac{dm}{dt} + \frac{3m}{2t+120} = 50 + 50\sin(t)$
 $\int \frac{3}{2t+120} dt = \frac{3}{2} \ln(2t+120)$
 $e^{\frac{3}{2} \ln(2t+120)} = (2t+120)^{3/2}$
 $(2t+120)^{3/2} \frac{dm}{dt} + (2t+120)^{3/2} \times \frac{3m}{2t+120} = 50(2t+120)^{3/2} + 50\sin(t)(2t+120)^{3/2}$
 $\frac{d(m(2t+120)^{3/2})}{dt} = 50(2t+120)^{3/2} + 50\sin(t)(2t+120)^{3/2}$
 $m(2t+120)^{3/2} = \int (50(2t+120)^{3/2} + 50\sin(t)(2t+120)^{3/2}) dt$
 $= 20(50(2t+120)^{5/2} + 50 \int \sin(t)(2t+120)^{3/2} dt)$

$$\frac{1}{10} \int (50(2t+120)^{-1/2} + 50 \sin(t)(2t+120)^{-1/2}) dt \quad \text{step 1}$$

$$\int 50 \sin(t)(2t+120)^{-1/2} = 50(-\cos(t)(2t+120)^{-1/2} + 3 \int \cos(t)(2t+120)^{-1/2} dt) \quad \text{step 2}$$

$$\int \cos(t)(2t+120)^{-1/2} = \sin(t)(2t+120)^{-1/2} - \int \sin(t)(2t+120)^{-1/2} dt \quad \text{step 3}$$

$$\int \sin(t)(2t+120)^{-1/2} dt \equiv \frac{1}{\sqrt{2}} \int \sin(t) \times (t+60)^{-1/2} dt$$

$$\text{let } u = \sqrt{t+60}, \quad \frac{du}{dt} = \frac{1}{2\sqrt{t+60}}$$

$$\therefore \frac{2}{\sqrt{2}} \int \sin(u^2-60) du$$

$$\sin(A-B) = \sin A \cos B - \sin B \cos A$$

$$\begin{aligned} \sqrt{2} \int \sin(u^2) \cos(60) - \sin(60) \cos(u^2) du &= \sqrt{2} \left(\cos(60) \left(\frac{\sqrt{2}}{2} \cdot S\left(\frac{\sqrt{2}}{\sqrt{2}}\right) \right) - \sin(60) \left(\frac{\sqrt{2}}{2} \cdot C\left(\frac{\sqrt{2}}{\sqrt{2}}\right) \right) \right) \\ &= \sqrt{2} \left(\cos(60) \cdot S\left(\frac{\sqrt{2}}{\sqrt{2}}\right) - \sin(60) \cdot C\left(\frac{\sqrt{2}}{\sqrt{2}}\right) \right) \\ &= \sqrt{2} \left(\cos(60) \cdot S\left(\sqrt{\frac{2t+120}{2}}\right) - \sin(60) \cdot C\left(\sqrt{\frac{2t+120}{2}}\right) \right) \end{aligned}$$

returning to step 3

$$\int \cos(t) \sqrt{2t+120} dt = \sin(t) \sqrt{2t+120} - \sqrt{2} \left(\frac{1}{2} \cos(60) \cdot S\left(\sqrt{\frac{2t+120}{2}}\right) - \sin(60) \cdot C\left(\sqrt{\frac{2t+120}{2}}\right) \right)$$

returning to step 1

$$50 \int \sin(t)(2t+120)^{-1/2} = -50 \cos(t)(2t+120)^{-1/2} + 150 \sin(t) \sqrt{2t+120} - 150 \sqrt{2} \left(\cos(60) \cdot S\left(\sqrt{\frac{2t+120}{2}}\right) - \sin(60) \cdot C\left(\sqrt{\frac{2t+120}{2}}\right) \right)$$

$$= 10(2t+120) - 50 \cos(t) + \frac{150 \sin(t)}{2t+120} - \frac{150 \sqrt{2} \left(\cos(60) \cdot S\left(\sqrt{\frac{2t+120}{2}}\right) - \sin(60) \cdot C\left(\sqrt{\frac{2t+120}{2}}\right) \right)}{(2t+120)^{3/2}} + C_1$$

$$m(0) = 150$$

$$150 = 10(120) - 50 \cos(0) + 0 - \frac{150\sqrt{\pi} \left(\cos(60) \cdot 5 \left(\sqrt{\frac{120}{\pi}} \right) - \sin(60) \cdot C \left(\sqrt{\frac{120}{\pi}} \right) \right)}{120^{\frac{3}{2}}} + \frac{C_1}{(120)^{\frac{3}{2}}}$$

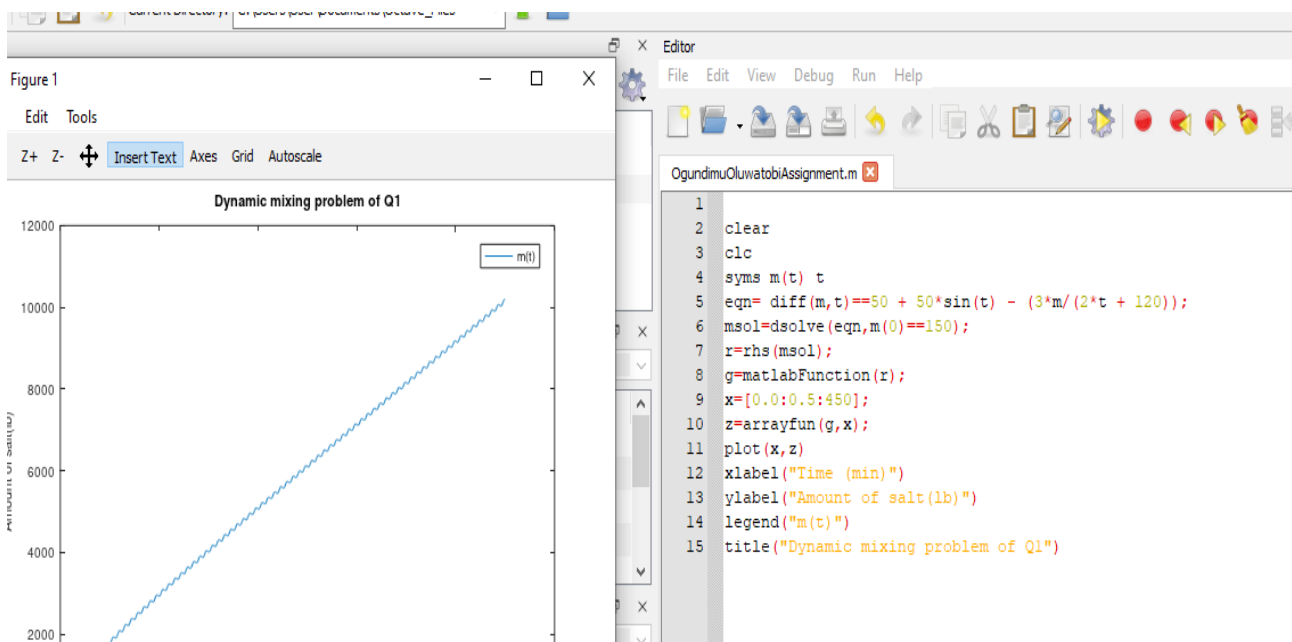
$$150 = 1200 - 50 - 150\sqrt{\pi} (-0.000285) + \frac{C_1}{120^{\frac{3}{2}}}$$

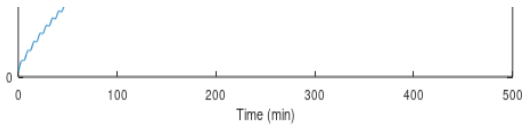
$$(150 - 1200 + 50 + 150(0.000285\sqrt{\pi})) \times 120^{\frac{3}{2}} = C_1$$

$$C_1 = -1.3146 \times 10^6$$

$$m = 20t + 1200 - 50 \cos(t) + \frac{150 \sin(t)}{2t + 120} - \frac{150\sqrt{\pi} \left(\cos(60) \cdot 5 \left(\sqrt{\frac{2t+120}{\pi}} \right) - \sin(60) \cdot C \left(\sqrt{\frac{2t+120}{\pi}} \right) \right)}{(2t + 120)^{\frac{3}{2}}} + 1.3146 \times 10^6$$

$$\therefore m = 20t + 1200 - 50 \cos(t) + \frac{150 \sin(t)}{2t + 120} - \frac{150\sqrt{\pi} \left(\cos(60) \cdot 5 \left(\sqrt{\frac{2t+120}{\pi}} \right) - \sin(60) \cdot C \left(\sqrt{\frac{2t+120}{\pi}} \right) \right)}{(2t + 120)^{\frac{3}{2}}} - \frac{1.315 \times 10^6}{(2t + 120)^{\frac{3}{2}}}$$





737.24

mbolic
OluwatobiAssignment

line: 10 col: 17 encoding: SYSTEM eol: CRLF

Command Window Documentation Editor Variable Editor

Current Directory: C:\Users\User\Documents\Octave_Files

Editor

File Edit View Debug Run Help

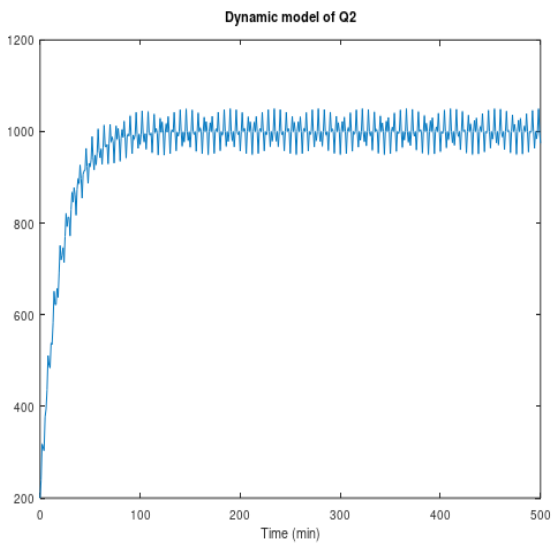
File Edit View Debug Run Help

OgundimuOluwatobiAssignment.m OgundimuOluwatobiAssignmentQ2.m

Figure 1

Edit Tools

+ Z- Insert Text Axes Grid Autoscale



```

7
8 for i=x
9     if (mod(i,2)==0)
10        z=[z y(i)];
11    else
12        z=[z y_m(i)];
13    end
14 end
15
16 plot(x,z)
17 xlabel("Time (min)")
18 ylabel("Volume (litres)")
19 title("Dynamic model of Q2")
20 z=z';
21 x=x';
22 A=[x z];
23 filename='odevbesdata.xlsx';
24 sheet = 'veriler';
25 xlswrite(filename,'t (min)',sheet,'A1')
26 xlswrite(filename,'V (litre)',sheet,'B1')
27 xlswrite(filename,A,sheet,'A2')
28 function y=y(t)
29     y=50/0.05 + (50/1.0025)*sin(t)+50*(0.05*cos(t))/1.0025 -802.49*exp(-0
30 end
31

```

col: 6 encoding: SYSTEM eol: CRLF

Command Window Documentation Editor Variable Editor

