

BULLEM, FLORENCE ILUEH-OCHUWEH
16/ENG01/005
CHEMICAL ENGINEERING
MID-SEMESTER TEST

QUESTION1

```

commandwindow
clear
clc
syms y(t)
T1 = diff(y,t,1)
T2 = diff(y,t,2)
d = [T2 + (5*T1) + (6*y)== cos(t)]
dy = diff(y,t)
dcond = [y(0)==5,dy(0)==3]
solution = dsolve(d,dcond)
pretty(solution)
tn = [0:0.1:50]
z = subs(solution,tn)
figure(1)
plot(tn,z)
xlabel('time (min)')
ylabel('vibrations')
grid on
grid minor
axis tight

```

results

d(t) =

$$6*y(t) + 5*diff(y(t), t) + diff(y(t), t, t) == cos(t)$$

solution =

$$(88*exp(-2*t))/5 - (127*exp(-3*t))/10 + (2^(1/2)*cos(t - pi/4))/10$$

$$\frac{\exp(-2 t) 88}{5} - \frac{\exp(-3 t) 127}{10} + \frac{\sqrt{2} \cos\left(t - \frac{\pi}{4}\right)}{10}$$

tn =

Columns 1 through 12

0 0.1000 0.2000 0.3000 0.4000 0.5000
0.6000 0.7000 0.8000 0.9000 1.0000 1.1000

Columns 13 through 24

1.2000 1.3000 1.4000 1.5000 1.6000 1.7000
1.8000 1.9000 2.0000 2.1000 2.2000 2.3000

Columns 25 through 36

2.4000 2.5000 2.6000 2.7000 2.8000 2.9000
3.0000 3.1000 3.2000 3.3000 3.4000 3.5000

Columns 37 through 48

3.6000 3.7000 3.8000 3.9000 4.0000 4.1000
4.2000 4.3000 4.4000 4.5000 4.6000 4.7000

Columns 49 through 60

4.8000 4.9000 5.0000 5.1000 5.2000 5.3000
5.4000 5.5000 5.6000 5.7000 5.8000 5.9000

Columns 61 through 72

6.0000 6.1000 6.2000 6.3000 6.4000 6.5000
6.6000 6.7000 6.8000 6.9000 7.0000 7.1000

Columns 73 through 84

7.2000 7.3000 7.4000 7.5000 7.6000 7.7000
7.8000 7.9000 8.0000 8.1000 8.2000 8.3000

Columns 85 through 96

8.4000 8.5000 8.6000 8.7000 8.8000 8.9000
9.0000 9.1000 9.2000 9.3000 9.4000 9.5000

Columns 97 through 108

9.6000 9.7000 9.8000 9.9000 10.0000 10.1000
10.2000 10.3000 10.4000 10.5000 10.6000 10.7000

Columns 109 through 120

10.8000 10.9000 11.0000 11.1000 11.2000 11.3000
11.4000 11.5000 11.6000 11.7000 11.8000 11.9000

Columns 121 through 132

12.0000 12.1000 12.2000 12.3000 12.4000 12.5000
12.6000 12.7000 12.8000 12.9000 13.0000 13.1000

Columns 133 through 144

13.2000 13.3000 13.4000 13.5000 13.6000 13.7000
13.8000 13.9000 14.0000 14.1000 14.2000 14.3000

Columns 145 through 156

14.4000 14.5000 14.6000 14.7000 14.8000 14.9000
15.0000 15.1000 15.2000 15.3000 15.4000 15.5000

Columns 157 through 168

15.6000 15.7000 15.8000 15.9000 16.0000 16.1000
16.2000 16.3000 16.4000 16.5000 16.6000 16.7000

Columns 169 through 180

16.8000 16.9000 17.0000 17.1000 17.2000 17.3000
17.4000 17.5000 17.6000 17.7000 17.8000 17.9000

Columns 181 through 192

18.0000 18.1000 18.2000 18.3000 18.4000 18.5000
18.6000 18.7000 18.8000 18.9000 19.0000 19.1000

Columns 193 through 204

19.2000 19.3000 19.4000 19.5000 19.6000 19.7000
19.8000 19.9000 20.0000 20.1000 20.2000 20.3000

Columns 205 through 216

20.4000 20.5000 20.6000 20.7000 20.8000 20.9000
21.0000 21.1000 21.2000 21.3000 21.4000 21.5000

Columns 217 through 228

21.6000 21.7000 21.8000 21.9000 22.0000 22.1000
22.2000 22.3000 22.4000 22.5000 22.6000 22.7000

Columns 229 through 240

22.8000	22.9000	23.0000	23.1000	23.2000	23.3000
23.4000	23.5000	23.6000	23.7000	23.8000	23.9000

Columns 241 through 252

24.0000	24.1000	24.2000	24.3000	24.4000	24.5000
24.6000	24.7000	24.8000	24.9000	25.0000	25.1000

Columns 253 through 264

25.2000	25.3000	25.4000	25.5000	25.6000	25.7000
25.8000	25.9000	26.0000	26.1000	26.2000	26.3000

Columns 265 through 276

26.4000	26.5000	26.6000	26.7000	26.8000	26.9000
27.0000	27.1000	27.2000	27.3000	27.4000	27.5000

Columns 277 through 288

27.6000	27.7000	27.8000	27.9000	28.0000	28.1000
28.2000	28.3000	28.4000	28.5000	28.6000	28.7000

Columns 289 through 300

28.8000	28.9000	29.0000	29.1000	29.2000	29.3000
29.4000	29.5000	29.6000	29.7000	29.8000	29.9000

Columns 301 through 312

30.0000	30.1000	30.2000	30.3000	30.4000	30.5000
30.6000	30.7000	30.8000	30.9000	31.0000	31.1000

Columns 313 through 324

31.2000	31.3000	31.4000	31.5000	31.6000	31.7000
31.8000	31.9000	32.0000	32.1000	32.2000	32.3000

Columns 325 through 336

32.4000	32.5000	32.6000	32.7000	32.8000	32.9000
33.0000	33.1000	33.2000	33.3000	33.4000	33.5000

Columns 337 through 348

33.6000 33.7000 33.8000 33.9000 34.0000 34.1000
34.2000 34.3000 34.4000 34.5000 34.6000 34.7000

Columns 349 through 360

34.8000 34.9000 35.0000 35.1000 35.2000 35.3000
35.4000 35.5000 35.6000 35.7000 35.8000 35.9000

Columns 361 through 372

36.0000 36.1000 36.2000 36.3000 36.4000 36.5000
36.6000 36.7000 36.8000 36.9000 37.0000 37.1000

Columns 373 through 384

37.2000 37.3000 37.4000 37.5000 37.6000 37.7000
37.8000 37.9000 38.0000 38.1000 38.2000 38.3000

Columns 385 through 396

38.4000 38.5000 38.6000 38.7000 38.8000 38.9000
39.0000 39.1000 39.2000 39.3000 39.4000 39.5000

Columns 397 through 408

39.6000 39.7000 39.8000 39.9000 40.0000 40.1000
40.2000 40.3000 40.4000 40.5000 40.6000 40.7000

Columns 409 through 420

40.8000 40.9000 41.0000 41.1000 41.2000 41.3000
41.4000 41.5000 41.6000 41.7000 41.8000 41.9000

Columns 421 through 432

42.0000 42.1000 42.2000 42.3000 42.4000 42.5000
42.6000 42.7000 42.8000 42.9000 43.0000 43.1000

Columns 433 through 444

43.2000 43.3000 43.4000 43.5000 43.6000 43.7000
43.8000 43.9000 44.0000 44.1000 44.2000 44.3000

Columns 445 through 456

44.4000 44.5000 44.6000 44.7000 44.8000 44.9000
45.0000 45.1000 45.2000 45.3000 45.4000 45.5000

Columns 457 through 468

45.6000 45.7000 45.8000 45.9000 46.0000 46.1000
46.2000 46.3000 46.4000 46.5000 46.6000 46.7000

Columns 469 through 480

46.8000 46.9000 47.0000 47.1000 47.2000 47.3000
47.4000 47.5000 47.6000 47.7000 47.8000 47.9000

Columns 481 through 492

48.0000 48.1000 48.2000 48.3000 48.4000 48.5000
48.6000 48.7000 48.8000 48.9000 49.0000 49.1000

Columns 493 through 501

49.2000 49.3000 49.4000 49.5000 49.6000 49.7000
49.8000 49.9000 50.0000

z =

[5, (88*exp(-1/5))/5 - (127*exp(-3/10))/10 + (2^(1/2)*cos(pi/4 - 1/10))/10, (88*exp(-2/5))/5 - (127*exp(-3/5))/10 + (2^(1/2)*cos(pi/4 - 1/5))/10, (88*exp(-3/5))/5 - (127*exp(-9/10))/10 + (2^(1/2)*cos(pi/4 - 3/10))/10, (88*exp(-4/5))/5 - (127*exp(-6/5))/10 + (2^(1/2)*cos(pi/4 - 2/5))/10, (88*exp(-1))/5 - (127*exp(-3/2))/10 + (2^(1/2)*cos(pi/4 - 1/2))/10, (88*exp(-6/5))/5 - (127*exp(-9/5))/10 + (2^(1/2)*cos(pi/4 - 3/5))/10, (88*exp(-7/5))/5 - (127*exp(-21/10))/10 + (2^(1/2)*cos(pi/4 - 7/10))/10, (88*exp(-8/5))/5 - (127*exp(-12/5))/10 + (2^(1/2)*cos(pi/4 - 4/5))/10, (88*exp(-9/5))/5 - (127*exp(-27/10))/10 + (2^(1/2)*cos(pi/4 - 9/10))/10, (88*exp(-2))/5 - (127*exp(-3))/10 + (2^(1/2)*cos(pi/4 - 1))/10, (88*exp(-11/5))/5 - (127*exp(-33/10))/10 + (2^(1/2)*cos(pi/4 - 11/10))/10, (88*exp(-12/5))/5 - (127*exp(-18/5))/10 + (2^(1/2)*cos(pi/4 - 6/5))/10, (88*exp(-13/5))/5 - (127*exp(-39/10))/10 + (2^(1/2)*cos(pi/4 - 13/10))/10, (88*exp(-14/5))/5 - (127*exp(-21/5))/10 + (2^(1/2)*cos(pi/4 - 7/5))/10, (88*exp(-3))/5 - (127*exp(-9/2))/10 + (2^(1/2)*cos(pi/4 - 3/2))/10, (88*exp(-16/5))/5 - (127*exp(-24/5))/10 + (2^(1/2)*cos(pi/4 - 8/5))/10, (88*exp(-17/5))/5 - (127*exp(-51/10))/10 + (2^(1/2)*cos(pi/4 - 17/10))/10, (88*exp(-18/5))/5 - (127*exp(-27/5))/10 + (2^(1/2)*cos(pi/4 - 9/5))/10, (88*exp(-19/5))/5 - (127*exp(-57/10))/10 + (2^(1/2)*cos(pi/4 - 19/10))/10, (88*exp(-4))/5 - (127*exp(-6))/10 + (2^(1/2)*cos(pi/4 - 2))/10, (88*exp(-21/5))/5 - (127*exp(-63/10))/10 + (2^(1/2)*cos(pi/4 - 21/10))/10, (88*exp(-22/5))/5 - (127*exp(-33/5))/10 + (2^(1/2)*cos(pi/4 - 11/5))/10, (88*exp(-23/5))/5 - (127*exp(-69/10))/10 + (2^(1/2)*cos(pi/4 - 23/10))/10, (88*exp(-24/5))/5 - (127*exp(-36/5))/10 + (2^(1/2)*cos(pi/4

- 12/5))/10, (88*exp(-5))/5 - (127*exp(-15/2))/10 + (2^(1/2)*cos(pi/4 - 5/2))/10, (88*exp(-26/5))/5 - (127*exp(-39/5))/10 + (2^(1/2)*cos(pi/4 - 13/5))/10, (88*exp(-27/5))/5 - (127*exp(-81/10))/10 + (2^(1/2)*cos(pi/4 - 27/10))/10, (88*exp(-28/5))/5 - (127*exp(-42/5))/10 + (2^(1/2)*cos(pi/4 - 14/5))/10, (88*exp(-29/5))/5 - (127*exp(-87/10))/10 + (2^(1/2)*cos(pi/4 - 29/10))/10, (88*exp(-6))/5 - (127*exp(-9))/10 + (2^(1/2)*cos(pi/4 - 3))/10, (88*exp(-31/5))/5 - (127*exp(-93/10))/10 + (2^(1/2)*cos(pi/4 - 31/10))/10, (88*exp(-32/5))/5 - (127*exp(-48/5))/10 + (2^(1/2)*cos(pi/4 - 16/5))/10, (88*exp(-33/5))/5 - (127*exp(-99/10))/10 + (2^(1/2)*cos(pi/4 - 33/10))/10, (88*exp(-34/5))/5 - (127*exp(-51/5))/10 + (2^(1/2)*cos(pi/4 - 17/5))/10, (88*exp(-7))/5 - (127*exp(-21/2))/10 + (2^(1/2)*cos(pi/4 - 7/2))/10, (88*exp(-36/5))/5 - (127*exp(-54/5))/10 + (2^(1/2)*cos(pi/4 - 18/5))/10, (88*exp(-37/5))/5 - (127*exp(-111/10))/10 + (2^(1/2)*cos(pi/4 - 37/10))/10, (88*exp(-38/5))/5 - (127*exp(-57/5))/10 + (2^(1/2)*cos(pi/4 - 19/5))/10, (88*exp(-39/5))/5 - (127*exp(-117/10))/10 + (2^(1/2)*cos(pi/4 - 39/10))/10, (88*exp(-8))/5 - (127*exp(-12))/10 + (2^(1/2)*cos(pi/4 - 4))/10, (88*exp(-41/5))/5 - (127*exp(-123/10))/10 + (2^(1/2)*cos(pi/4 - 41/10))/10, (88*exp(-42/5))/5 - (127*exp(-63/5))/10 + (2^(1/2)*cos(pi/4 - 21/5))/10, (88*exp(-43/5))/5 - (127*exp(-129/10))/10 + (2^(1/2)*cos(pi/4 - 43/10))/10, (88*exp(-44/5))/5 - (127*exp(-66/5))/10 + (2^(1/2)*cos(pi/4 - 22/5))/10, (88*exp(-9))/5 - (127*exp(-27/2))/10 + (2^(1/2)*cos(pi/4 - 9/2))/10, (88*exp(-46/5))/5 - (127*exp(-69/5))/10 + (2^(1/2)*cos(pi/4 - 23/5))/10, (88*exp(-47/5))/5 - (127*exp(-141/10))/10 + (2^(1/2)*cos(pi/4 - 47/10))/10, (88*exp(-48/5))/5 - (127*exp(-72/5))/10 + (2^(1/2)*cos(pi/4 - 24/5))/10, (88*exp(-49/5))/5 - (127*exp(-147/10))/10 + (2^(1/2)*cos(pi/4 - 49/10))/10, (88*exp(-10))/5 - (127*exp(-15))/10 + (2^(1/2)*cos(pi/4 - 5))/10, (88*exp(-51/5))/5 - (127*exp(-153/10))/10 + (2^(1/2)*cos(pi/4 - 51/10))/10, (88*exp(-52/5))/5 - (127*exp(-78/5))/10 + (2^(1/2)*cos(pi/4 - 26/5))/10, (88*exp(-53/5))/5 - (127*exp(-159/10))/10 + (2^(1/2)*cos(pi/4 - 53/10))/10, (88*exp(-54/5))/5 - (127*exp(-81/5))/10 + (2^(1/2)*cos(pi/4 - 27/5))/10, (88*exp(-11))/5 - (127*exp(-33/2))/10 + (2^(1/2)*cos(pi/4 - 11/2))/10, (88*exp(-56/5))/5 - (127*exp(-84/5))/10 + (2^(1/2)*cos(pi/4 - 28/5))/10, (88*exp(-57/5))/5 - (127*exp(-171/10))/10 + (2^(1/2)*cos(pi/4 - 57/10))/10, (88*exp(-58/5))/5 - (127*exp(-87/5))/10 + (2^(1/2)*cos(pi/4 - 29/5))/10, (88*exp(-59/5))/5 - (127*exp(-177/10))/10 + (2^(1/2)*cos(pi/4 - 59/10))/10, (88*exp(-12))/5 - (127*exp(-18))/10 + (2^(1/2)*cos(pi/4 - 6))/10, (88*exp(-61/5))/5 - (127*exp(-183/10))/10 + (2^(1/2)*cos(pi/4 - 61/10))/10, (88*exp(-62/5))/5 - (127*exp(-93/5))/10 + (2^(1/2)*cos(pi/4 - 31/5))/10, (88*exp(-63/5))/5 - (127*exp(-189/10))/10 + (2^(1/2)*cos(pi/4 - 63/10))/10, (88*exp(-64/5))/5 - (127*exp(-96/5))/10 + (2^(1/2)*cos(pi/4 - 32/5))/10, (88*exp(-13))/5 - (127*exp(-39/2))/10 + (2^(1/2)*cos(pi/4 - 13/2))/10, (88*exp(-66/5))/5 - (127*exp(-99/5))/10 + (2^(1/2)*cos(pi/4 - 33/5))/10, (88*exp(-67/5))/5 - (127*exp(-201/10))/10 + (2^(1/2)*cos(pi/4 - 67/10))/10, (88*exp(-68/5))/5 - (127*exp(-102/5))/10 + (2^(1/2)*cos(pi/4 - 34/5))/10, (88*exp(-69/5))/5 - (127*exp(-207/10))/10 + (2^(1/2)*cos(pi/4 - 69/10))/10, (88*exp(-14))/5 - (127*exp(-21))/10 + (2^(1/2)*cos(pi/4 - 7))/10, (88*exp(-71/5))/5 - (127*exp(-213/10))/10 + (2^(1/2)*cos(pi/4 - 71/10))/10, (88*exp(-72/5))/5 - (127*exp(-108/5))/10 + (2^(1/2)*cos(pi/4 - 36/5))/10, (88*exp(-73/5))/5 - (127*exp(-219/10))/10 + (2^(1/2)*cos(pi/4 - 73/10))/10, (88*exp(-74/5))/5 - (127*exp(-111/5))/10 + (2^(1/2)*cos(pi/4 - 37/5))/10, (88*exp(-15))/5 - (127*exp(-45/2))/10 + (2^(1/2)*cos(pi/4 - 15/2))/10, (88*exp(-76/5))/5 - (127*exp(-114/5))/10 + (2^(1/2)*cos(pi/4 - 38/5))/10, (88*exp(-77/5))/5 - (127*exp(-231/10))/10 + (2^(1/2)*cos(pi/4 - 77/10))/10, (88*exp(-78/5))/5 - (127*exp(-117/5))/10 + (2^(1/2)*cos(pi/4 - 39/5))/10, (88*exp(-79/5))/5 - (127*exp(-237/10))/10 + (2^(1/2)*cos(pi/4 - 79/10))/10, (88*exp(-16))/5 - (127*exp(-24))/10 + (2^(1/2)*cos(pi/4 - 8))/10, (88*exp(-81/5))/5 -

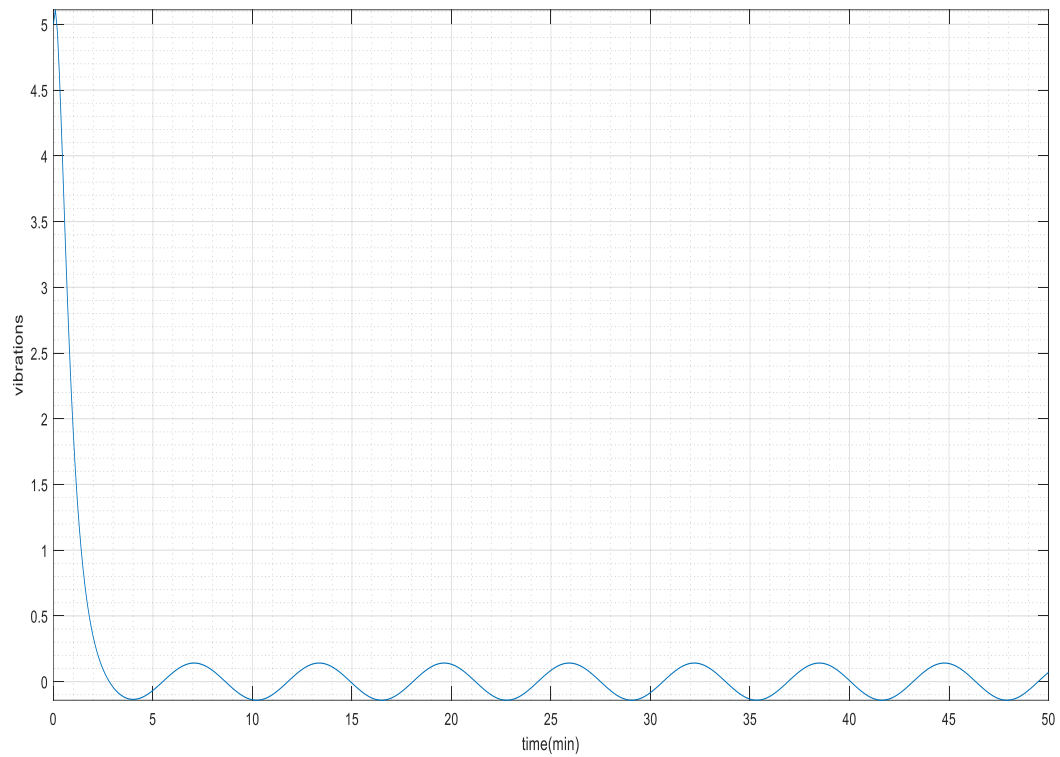
$$\begin{aligned} & 68/5)/10, (88*\exp(-137/5))/5 - (127*\exp(-411/10))/10 + (2^{1/2}*\cos(\pi/4 - 137/10))/10, (88*\exp(- \\ & 138/5))/5 - (127*\exp(-207/5))/10 + (2^{1/2}*\cos(\pi/4 - 69/5))/10, (88*\exp(-139/5))/5 - (127*\exp(- \\ & 417/10))/10 + (2^{1/2}*\cos(\pi/4 - 139/10))/10, (88*\exp(-28))/5 - (127*\exp(-42))/10 + (2^{1/2}*\cos(\pi/4 - \\ & 14))/10, (88*\exp(-141/5))/5 - (127*\exp(-423/10))/10 + (2^{1/2}*\cos(\pi/4 - 141/10))/10, (88*\exp(- \\ & 142/5))/5 - (127*\exp(-213/5))/10 + (2^{1/2}*\cos(\pi/4 - 71/5))/10, (88*\exp(-143/5))/5 - (127*\exp(- \\ & 429/10))/10 + (2^{1/2}*\cos(\pi/4 - 143/10))/10, (88*\exp(-144/5))/5 - (127*\exp(-216/5))/10 + \\ & (2^{1/2}*\cos(\pi/4 - 72/5))/10, (88*\exp(-29))/5 - (127*\exp(-87/2))/10 + (2^{1/2}*\cos(\pi/4 - 29/2))/10, \\ & (88*\exp(-146/5))/5 - (127*\exp(-219/5))/10 + (2^{1/2}*\cos(\pi/4 - 73/5))/10, (88*\exp(-147/5))/5 - \\ & (127*\exp(-441/10))/10 + (2^{1/2}*\cos(\pi/4 - 147/10))/10, (88*\exp(-148/5))/5 - (127*\exp(-222/5))/10 + \\ & (2^{1/2}*\cos(\pi/4 - 74/5))/10, (88*\exp(-149/5))/5 - (127*\exp(-447/10))/10 + (2^{1/2}*\cos(\pi/4 - \\ & 149/10))/10, (88*\exp(-30))/5 - (127*\exp(-45))/10 + (2^{1/2}*\cos(\pi/4 - 15))/10, (88*\exp(-151/5))/5 - \\ & (127*\exp(-453/10))/10 + (2^{1/2}*\cos(\pi/4 - 151/10))/10, (88*\exp(-152/5))/5 - (127*\exp(-228/5))/10 + \\ & (2^{1/2}*\cos(\pi/4 - 76/5))/10, (88*\exp(-153/5))/5 - (127*\exp(-459/10))/10 + (2^{1/2}*\cos(\pi/4 - \\ & 153/10))/10, (88*\exp(-154/5))/5 - (127*\exp(-231/5))/10 + (2^{1/2}*\cos(\pi/4 - 77/5))/10, (88*\exp(-31))/5 \\ & - (127*\exp(-93/2))/10 + (2^{1/2}*\cos(\pi/4 - 31/2))/10, (88*\exp(-156/5))/5 - (127*\exp(-234/5))/10 + \\ & (2^{1/2}*\cos(\pi/4 - 78/5))/10, (88*\exp(-157/5))/5 - (127*\exp(-471/10))/10 + (2^{1/2}*\cos(\pi/4 - \\ & 157/10))/10, (88*\exp(-158/5))/5 - (127*\exp(-237/5))/10 + (2^{1/2}*\cos(\pi/4 - 79/5))/10, (88*\exp(- \\ & 159/5))/5 - (127*\exp(-477/10))/10 + (2^{1/2}*\cos(\pi/4 - 159/10))/10, (88*\exp(-32))/5 - (127*\exp(- \\ & 48))/10 + (2^{1/2}*\cos(\pi/4 - 16))/10, (88*\exp(-161/5))/5 - (127*\exp(-483/10))/10 + (2^{1/2}*\cos(\pi/4 - \\ & 161/10))/10, (88*\exp(-162/5))/5 - (127*\exp(-243/5))/10 + (2^{1/2}*\cos(\pi/4 - 81/5))/10, (88*\exp(- \\ & 163/5))/5 - (127*\exp(-489/10))/10 + (2^{1/2}*\cos(\pi/4 - 163/10))/10, (88*\exp(-164/5))/5 - (127*\exp(- \\ & 246/5))/10 + (2^{1/2}*\cos(\pi/4 - 82/5))/10, (88*\exp(-33))/5 - (127*\exp(-99/2))/10 + (2^{1/2}*\cos(\pi/4 - \\ & 33/2))/10, (88*\exp(-166/5))/5 - (127*\exp(-249/5))/10 + (2^{1/2}*\cos(\pi/4 - 83/5))/10, (88*\exp(- \\ & 167/5))/5 - (127*\exp(-501/10))/10 + (2^{1/2}*\cos(\pi/4 - 167/10))/10, (88*\exp(-168/5))/5 - (127*\exp(- \\ & 252/5))/10 + (2^{1/2}*\cos(\pi/4 - 84/5))/10, (88*\exp(-169/5))/5 - (127*\exp(-507/10))/10 + \\ & (2^{1/2}*\cos(\pi/4 - 169/10))/10, (88*\exp(-34))/5 - (127*\exp(-51))/10 + (2^{1/2}*\cos(\pi/4 - 17))/10, \\ & (88*\exp(-171/5))/5 - (127*\exp(-513/10))/10 + (2^{1/2}*\cos(\pi/4 - 171/10))/10, (88*\exp(-172/5))/5 - \\ & (127*\exp(-258/5))/10 + (2^{1/2}*\cos(\pi/4 - 86/5))/10, (88*\exp(-173/5))/5 - (127*\exp(-519/10))/10 + \\ & (2^{1/2}*\cos(\pi/4 - 173/10))/10, (88*\exp(-174/5))/5 - (127*\exp(-261/5))/10 + (2^{1/2}*\cos(\pi/4 - \\ & 87/5))/10, (88*\exp(-35))/5 - (127*\exp(-105/2))/10 + (2^{1/2}*\cos(\pi/4 - 35/2))/10, (88*\exp(-176/5))/5 - \\ & (127*\exp(-264/5))/10 + (2^{1/2}*\cos(\pi/4 - 88/5))/10, (88*\exp(-177/5))/5 - (127*\exp(-531/10))/10 + \\ & (2^{1/2}*\cos(\pi/4 - 177/10))/10, (88*\exp(-178/5))/5 - (127*\exp(-267/5))/10 + (2^{1/2}*\cos(\pi/4 - \\ & 89/5))/10, (88*\exp(-179/5))/5 - (127*\exp(-537/10))/10 + (2^{1/2}*\cos(\pi/4 - 179/10))/10, (88*\exp(- \\ & 36))/5 - (127*\exp(-54))/10 + (2^{1/2}*\cos(\pi/4 - 18))/10, (88*\exp(-181/5))/5 - (127*\exp(-543/10))/10 + \\ & (2^{1/2}*\cos(\pi/4 - 181/10))/10, (88*\exp(-182/5))/5 - (127*\exp(-273/5))/10 + (2^{1/2}*\cos(\pi/4 - \\ & 91/5))/10, (88*\exp(-183/5))/5 - (127*\exp(-549/10))/10 + (2^{1/2}*\cos(\pi/4 - 183/10))/10, (88*\exp(- \\ & 184/5))/5 - (127*\exp(-276/5))/10 + (2^{1/2}*\cos(\pi/4 - 92/5))/10, (88*\exp(-37))/5 - (127*\exp(- \\ & 111/2))/10 + (2^{1/2}*\cos(\pi/4 - 37/2))/10, (88*\exp(-186/5))/5 - (127*\exp(-279/5))/10 + \\ & (2^{1/2}*\cos(\pi/4 - 93/5))/10, (88*\exp(-187/5))/5 - (127*\exp(-561/10))/10 + (2^{1/2}*\cos(\pi/4 - \\ & 187/10))/10, (88*\exp(-188/5))/5 - (127*\exp(-282/5))/10 + (2^{1/2}*\cos(\pi/4 - 94/5))/10, (88*\exp(- \\ & 189/5))/5 - (127*\exp(-567/10))/10 + (2^{1/2}*\cos(\pi/4 - 189/10))/10, (88*\exp(-38))/5 - (127*\exp(- \\ & 57))/10 + (2^{1/2}*\cos(\pi/4 - 19))/10, (88*\exp(-191/5))/5 - (127*\exp(-573/10))/10 + (2^{1/2}*\cos(\pi/4 - \end{aligned}$$

$$\begin{aligned}
& 191/10)/10, (88*\exp(-192/5))/5 - (127*\exp(-288/5))/10 + (2^{1/2}*\cos(\pi/4 - 96/5))/10, (88*\exp(- \\
& 193/5))/5 - (127*\exp(-579/10))/10 + (2^{1/2}*\cos(\pi/4 - 193/10))/10, (88*\exp(-194/5))/5 - (127*\exp(- \\
& 291/5))/10 + (2^{1/2}*\cos(\pi/4 - 97/5))/10, (88*\exp(-39))/5 - (127*\exp(-117/2))/10 + (2^{1/2}*\cos(\pi/4 - \\
& 39/2))/10, (88*\exp(-196/5))/5 - (127*\exp(-294/5))/10 + (2^{1/2}*\cos(\pi/4 - 98/5))/10, (88*\exp(- \\
& 197/5))/5 - (127*\exp(-591/10))/10 + (2^{1/2}*\cos(\pi/4 - 197/10))/10, (88*\exp(-198/5))/5 - (127*\exp(- \\
& 297/5))/10 + (2^{1/2}*\cos(\pi/4 - 99/5))/10, (88*\exp(-199/5))/5 - (127*\exp(-597/10))/10 + \\
& (2^{1/2}*\cos(\pi/4 - 199/10))/10, (88*\exp(-40))/5 - (127*\exp(-60))/10 + (2^{1/2}*\cos(\pi/4 - 20))/10, \\
& (88*\exp(-201/5))/5 - (127*\exp(-603/10))/10 + (2^{1/2}*\cos(\pi/4 - 201/10))/10, (88*\exp(-202/5))/5 - \\
& (127*\exp(-303/5))/10 + (2^{1/2}*\cos(\pi/4 - 101/5))/10, (88*\exp(-203/5))/5 - (127*\exp(-609/10))/10 + \\
& (2^{1/2}*\cos(\pi/4 - 203/10))/10, (88*\exp(-204/5))/5 - (127*\exp(-306/5))/10 + (2^{1/2}*\cos(\pi/4 - \\
& 102/5))/10, (88*\exp(-41))/5 - (127*\exp(-123/2))/10 + (2^{1/2}*\cos(\pi/4 - 41/2))/10, (88*\exp(-206/5))/5 - \\
& (127*\exp(-309/5))/10 + (2^{1/2}*\cos(\pi/4 - 103/5))/10, (88*\exp(-207/5))/5 - (127*\exp(-621/10))/10 + \\
& (2^{1/2}*\cos(\pi/4 - 207/10))/10, (88*\exp(-208/5))/5 - (127*\exp(-312/5))/10 + (2^{1/2}*\cos(\pi/4 - \\
& 104/5))/10, (88*\exp(-209/5))/5 - (127*\exp(-627/10))/10 + (2^{1/2}*\cos(\pi/4 - 209/10))/10, (88*\exp(- \\
& 42))/5 - (127*\exp(-63))/10 + (2^{1/2}*\cos(\pi/4 - 21))/10, (88*\exp(-211/5))/5 - (127*\exp(-633/10))/10 + \\
& (2^{1/2}*\cos(\pi/4 - 211/10))/10, (88*\exp(-212/5))/5 - (127*\exp(-318/5))/10 + (2^{1/2}*\cos(\pi/4 - \\
& 106/5))/10, (88*\exp(-213/5))/5 - (127*\exp(-639/10))/10 + (2^{1/2}*\cos(\pi/4 - 213/10))/10, (88*\exp(- \\
& 214/5))/5 - (127*\exp(-321/5))/10 + (2^{1/2}*\cos(\pi/4 - 107/5))/10, (88*\exp(-43))/5 - (127*\exp(- \\
& 129/2))/10 + (2^{1/2}*\cos(\pi/4 - 43/2))/10, (88*\exp(-216/5))/5 - (127*\exp(-324/5))/10 + \\
& (2^{1/2}*\cos(\pi/4 - 108/5))/10, (88*\exp(-217/5))/5 - (127*\exp(-651/10))/10 + (2^{1/2}*\cos(\pi/4 - \\
& 217/10))/10, (88*\exp(-218/5))/5 - (127*\exp(-327/5))/10 + (2^{1/2}*\cos(\pi/4 - 109/5))/10, (88*\exp(- \\
& 219/5))/5 - (127*\exp(-657/10))/10 + (2^{1/2}*\cos(\pi/4 - 219/10))/10, (88*\exp(-44))/5 - (127*\exp(- \\
& 66))/10 + (2^{1/2}*\cos(\pi/4 - 22))/10, (88*\exp(-221/5))/5 - (127*\exp(-663/10))/10 + (2^{1/2}*\cos(\pi/4 - \\
& 221/10))/10, (88*\exp(-222/5))/5 - (127*\exp(-333/5))/10 + (2^{1/2}*\cos(\pi/4 - 111/5))/10, (88*\exp(- \\
& 223/5))/5 - (127*\exp(-669/10))/10 + (2^{1/2}*\cos(\pi/4 - 223/10))/10, (88*\exp(-224/5))/5 - (127*\exp(- \\
& 336/5))/10 + (2^{1/2}*\cos(\pi/4 - 112/5))/10, (88*\exp(-45))/5 - (127*\exp(-135/2))/10 + (2^{1/2}*\cos(\pi/4 \\
& - 45/2))/10, (88*\exp(-226/5))/5 - (127*\exp(-339/5))/10 + (2^{1/2}*\cos(\pi/4 - 113/5))/10, (88*\exp(- \\
& 227/5))/5 - (127*\exp(-681/10))/10 + (2^{1/2}*\cos(\pi/4 - 227/10))/10, (88*\exp(-228/5))/5 - (127*\exp(- \\
& 342/5))/10 + (2^{1/2}*\cos(\pi/4 - 114/5))/10, (88*\exp(-229/5))/5 - (127*\exp(-687/10))/10 + \\
& (2^{1/2}*\cos(\pi/4 - 229/10))/10, (88*\exp(-46))/5 - (127*\exp(-69))/10 + (2^{1/2}*\cos(\pi/4 - 23))/10, \\
& (88*\exp(-231/5))/5 - (127*\exp(-693/10))/10 + (2^{1/2}*\cos(\pi/4 - 231/10))/10, (88*\exp(-232/5))/5 - \\
& (127*\exp(-348/5))/10 + (2^{1/2}*\cos(\pi/4 - 116/5))/10, (88*\exp(-233/5))/5 - (127*\exp(-699/10))/10 + \\
& (2^{1/2}*\cos(\pi/4 - 233/10))/10, (88*\exp(-234/5))/5 - (127*\exp(-351/5))/10 + (2^{1/2}*\cos(\pi/4 - \\
& 117/5))/10, (88*\exp(-47))/5 - (127*\exp(-141/2))/10 + (2^{1/2}*\cos(\pi/4 - 47/2))/10, (88*\exp(-236/5))/5 - \\
& (127*\exp(-354/5))/10 + (2^{1/2}*\cos(\pi/4 - 118/5))/10, (88*\exp(-237/5))/5 - (127*\exp(-711/10))/10 + \\
& (2^{1/2}*\cos(\pi/4 - 237/10))/10, (88*\exp(-238/5))/5 - (127*\exp(-357/5))/10 + (2^{1/2}*\cos(\pi/4 - \\
& 119/5))/10, (88*\exp(-239/5))/5 - (127*\exp(-717/10))/10 + (2^{1/2}*\cos(\pi/4 - 239/10))/10, (88*\exp(- \\
& 48))/5 - (127*\exp(-72))/10 + (2^{1/2}*\cos(\pi/4 - 24))/10, (88*\exp(-241/5))/5 - (127*\exp(-723/10))/10 + \\
& (2^{1/2}*\cos(\pi/4 - 241/10))/10, (88*\exp(-242/5))/5 - (127*\exp(-363/5))/10 + (2^{1/2}*\cos(\pi/4 - \\
& 121/5))/10, (88*\exp(-243/5))/5 - (127*\exp(-729/10))/10 + (2^{1/2}*\cos(\pi/4 - 243/10))/10, (88*\exp(- \\
& 244/5))/5 - (127*\exp(-366/5))/10 + (2^{1/2}*\cos(\pi/4 - 122/5))/10, (88*\exp(-49))/5 - (127*\exp(- \\
& 147/2))/10 + (2^{1/2}*\cos(\pi/4 - 49/2))/10, (88*\exp(-246/5))/5 - (127*\exp(-369/5))/10 +
\end{aligned}$$

$(2^{1/2} \cos(\pi/4 - 123/5))/10, (88 \exp(-247/5))/5 - (127 \exp(-741/10))/10 + (2^{1/2} \cos(\pi/4 - 247/10))/10, (88 \exp(-248/5))/5 - (127 \exp(-372/5))/10 + (2^{1/2} \cos(\pi/4 - 124/5))/10, (88 \exp(-249/5))/5 - (127 \exp(-747/10))/10 + (2^{1/2} \cos(\pi/4 - 249/10))/10, (88 \exp(-50))/5 - (127 \exp(-75))/10 + (2^{1/2} \cos(\pi/4 - 25))/10, (88 \exp(-251/5))/5 - (127 \exp(-753/10))/10 + (2^{1/2} \cos(\pi/4 - 251/10))/10, (88 \exp(-252/5))/5 - (127 \exp(-378/5))/10 + (2^{1/2} \cos(\pi/4 - 126/5))/10, (88 \exp(-253/5))/5 - (127 \exp(-759/10))/10 + (2^{1/2} \cos(\pi/4 - 253/10))/10, (88 \exp(-254/5))/5 - (127 \exp(-381/5))/10 + (2^{1/2} \cos(\pi/4 - 127/5))/10, (88 \exp(-51))/5 - (127 \exp(-153/2))/10 + (2^{1/2} \cos(\pi/4 - 51/2))/10, (88 \exp(-256/5))/5 - (127 \exp(-384/5))/10 + (2^{1/2} \cos(\pi/4 - 128/5))/10, (88 \exp(-257/5))/5 - (127 \exp(-771/10))/10 + (2^{1/2} \cos(\pi/4 - 257/10))/10, (88 \exp(-258/5))/5 - (127 \exp(-387/5))/10 + (2^{1/2} \cos(\pi/4 - 129/5))/10, (88 \exp(-259/5))/5 - (127 \exp(-777/10))/10 + (2^{1/2} \cos(\pi/4 - 259/10))/10, (88 \exp(-52))/5 - (127 \exp(-78))/10 + (2^{1/2} \cos(\pi/4 - 26))/10, (88 \exp(-261/5))/5 - (127 \exp(-783/10))/10 + (2^{1/2} \cos(\pi/4 - 261/10))/10, (88 \exp(-262/5))/5 - (127 \exp(-393/5))/10 + (2^{1/2} \cos(\pi/4 - 131/5))/10, (88 \exp(-263/5))/5 - (127 \exp(-789/10))/10 + (2^{1/2} \cos(\pi/4 - 263/10))/10, (88 \exp(-264/5))/5 - (127 \exp(-396/5))/10 + (2^{1/2} \cos(\pi/4 - 132/5))/10, (88 \exp(-53))/5 - (127 \exp(-159/2))/10 + (2^{1/2} \cos(\pi/4 - 53/2))/10, (88 \exp(-266/5))/5 - (127 \exp(-399/5))/10 + (2^{1/2} \cos(\pi/4 - 133/5))/10, (88 \exp(-267/5))/5 - (127 \exp(-801/10))/10 + (2^{1/2} \cos(\pi/4 - 267/10))/10, (88 \exp(-268/5))/5 - (127 \exp(-402/5))/10 + (2^{1/2} \cos(\pi/4 - 134/5))/10, (88 \exp(-269/5))/5 - (127 \exp(-807/10))/10 + (2^{1/2} \cos(\pi/4 - 269/10))/10, (88 \exp(-54))/5 - (127 \exp(-81))/10 + (2^{1/2} \cos(\pi/4 - 27))/10, (88 \exp(-271/5))/5 - (127 \exp(-813/10))/10 + (2^{1/2} \cos(\pi/4 - 271/10))/10, (88 \exp(-272/5))/5 - (127 \exp(-408/5))/10 + (2^{1/2} \cos(\pi/4 - 136/5))/10, (88 \exp(-273/5))/5 - (127 \exp(-819/10))/10 + (2^{1/2} \cos(\pi/4 - 273/10))/10, (88 \exp(-274/5))/5 - (127 \exp(-411/5))/10 + (2^{1/2} \cos(\pi/4 - 137/5))/10, (88 \exp(-55))/5 - (127 \exp(-165/2))/10 + (2^{1/2} \cos(\pi/4 - 55/2))/10, (88 \exp(-276/5))/5 - (127 \exp(-414/5))/10 + (2^{1/2} \cos(\pi/4 - 138/5))/10, (88 \exp(-277/5))/5 - (127 \exp(-831/10))/10 + (2^{1/2} \cos(\pi/4 - 277/10))/10, (88 \exp(-278/5))/5 - (127 \exp(-417/5))/10 + (2^{1/2} \cos(\pi/4 - 139/5))/10, (88 \exp(-279/5))/5 - (127 \exp(-837/10))/10 + (2^{1/2} \cos(\pi/4 - 279/10))/10, (88 \exp(-56))/5 - (127 \exp(-84))/10 + (2^{1/2} \cos(\pi/4 - 28))/10, (88 \exp(-281/5))/5 - (127 \exp(-843/10))/10 + (2^{1/2} \cos(\pi/4 - 281/10))/10, (88 \exp(-282/5))/5 - (127 \exp(-423/5))/10 + (2^{1/2} \cos(\pi/4 - 141/5))/10, (88 \exp(-283/5))/5 - (127 \exp(-849/10))/10 + (2^{1/2} \cos(\pi/4 - 283/10))/10, (88 \exp(-284/5))/5 - (127 \exp(-426/5))/10 + (2^{1/2} \cos(\pi/4 - 142/5))/10, (88 \exp(-57))/5 - (127 \exp(-171/2))/10 + (2^{1/2} \cos(\pi/4 - 57/2))/10, (88 \exp(-286/5))/5 - (127 \exp(-429/5))/10 + (2^{1/2} \cos(\pi/4 - 143/5))/10, (88 \exp(-287/5))/5 - (127 \exp(-861/10))/10 + (2^{1/2} \cos(\pi/4 - 287/10))/10, (88 \exp(-288/5))/5 - (127 \exp(-432/5))/10 + (2^{1/2} \cos(\pi/4 - 144/5))/10, (88 \exp(-289/5))/5 - (127 \exp(-867/10))/10 + (2^{1/2} \cos(\pi/4 - 289/10))/10, (88 \exp(-58))/5 - (127 \exp(-87))/10 + (2^{1/2} \cos(\pi/4 - 29))/10, (88 \exp(-291/5))/5 - (127 \exp(-873/10))/10 + (2^{1/2} \cos(\pi/4 - 291/10))/10, (88 \exp(-292/5))/5 - (127 \exp(-438/5))/10 + (2^{1/2} \cos(\pi/4 - 146/5))/10, (88 \exp(-293/5))/5 - (127 \exp(-879/10))/10 + (2^{1/2} \cos(\pi/4 - 293/10))/10, (88 \exp(-294/5))/5 - (127 \exp(-441/5))/10 + (2^{1/2} \cos(\pi/4 - 147/5))/10, (88 \exp(-59))/5 - (127 \exp(-177/2))/10 + (2^{1/2} \cos(\pi/4 - 59/2))/10, (88 \exp(-296/5))/5 - (127 \exp(-444/5))/10 + (2^{1/2} \cos(\pi/4 - 148/5))/10, (88 \exp(-297/5))/5 - (127 \exp(-891/10))/10 + (2^{1/2} \cos(\pi/4 - 297/10))/10, (88 \exp(-298/5))/5 - (127 \exp(-447/5))/10 + (2^{1/2} \cos(\pi/4 - 149/5))/10, (88 \exp(-299/5))/5 - (127 \exp(-897/10))/10 + (2^{1/2} \cos(\pi/4 - 299/10))/10, (88 \exp(-60))/5 - (127 \exp(-90))/10 + (2^{1/2} \cos(\pi/4 - 30))/10, (88 \exp(-301/5))/5 - (127 \exp(-903/10))/10 +$

$(2^{1/2} \cos(\pi/4 - 301/10))/10, (88 \exp(-302/5))/5 - (127 \exp(-453/5))/10 + (2^{1/2} \cos(\pi/4 - 151/5))/10, (88 \exp(-303/5))/5 - (127 \exp(-909/10))/10 + (2^{1/2} \cos(\pi/4 - 303/10))/10, (88 \exp(-304/5))/5 - (127 \exp(-456/5))/10 + (2^{1/2} \cos(\pi/4 - 152/5))/10, (88 \exp(-61))/5 - (127 \exp(-183/2))/10 + (2^{1/2} \cos(\pi/4 - 61/2))/10, (88 \exp(-306/5))/5 - (127 \exp(-459/5))/10 + (2^{1/2} \cos(\pi/4 - 153/5))/10, (88 \exp(-307/5))/5 - (127 \exp(-921/10))/10 + (2^{1/2} \cos(\pi/4 - 307/10))/10, (88 \exp(-308/5))/5 - (127 \exp(-462/5))/10 + (2^{1/2} \cos(\pi/4 - 154/5))/10, (88 \exp(-309/5))/5 - (127 \exp(-927/10))/10 + (2^{1/2} \cos(\pi/4 - 309/10))/10, (88 \exp(-62))/5 - (127 \exp(-93))/10 + (2^{1/2} \cos(\pi/4 - 31))/10, (88 \exp(-311/5))/5 - (127 \exp(-933/10))/10 + (2^{1/2} \cos(\pi/4 - 311/10))/10, (88 \exp(-312/5))/5 - (127 \exp(-468/5))/10 + (2^{1/2} \cos(\pi/4 - 156/5))/10, (88 \exp(-313/5))/5 - (127 \exp(-939/10))/10 + (2^{1/2} \cos(\pi/4 - 313/10))/10, (88 \exp(-314/5))/5 - (127 \exp(-471/5))/10 + (2^{1/2} \cos(\pi/4 - 157/5))/10, (88 \exp(-63))/5 - (127 \exp(-189/2))/10 + (2^{1/2} \cos(\pi/4 - 63/2))/10, (88 \exp(-316/5))/5 - (127 \exp(-474/5))/10 + (2^{1/2} \cos(\pi/4 - 158/5))/10, (88 \exp(-317/5))/5 - (127 \exp(-951/10))/10 + (2^{1/2} \cos(\pi/4 - 317/10))/10, (88 \exp(-318/5))/5 - (127 \exp(-477/5))/10 + (2^{1/2} \cos(\pi/4 - 159/5))/10, (88 \exp(-319/5))/5 - (127 \exp(-957/10))/10 + (2^{1/2} \cos(\pi/4 - 319/10))/10, (88 \exp(-64))/5 - (127 \exp(-96))/10 + (2^{1/2} \cos(\pi/4 - 32))/10, (88 \exp(-321/5))/5 - (127 \exp(-963/10))/10 + (2^{1/2} \cos(\pi/4 - 321/10))/10, (88 \exp(-322/5))/5 - (127 \exp(-483/5))/10 + (2^{1/2} \cos(\pi/4 - 161/5))/10, (88 \exp(-323/5))/5 - (127 \exp(-969/10))/10 + (2^{1/2} \cos(\pi/4 - 323/10))/10, (88 \exp(-324/5))/5 - (127 \exp(-486/5))/10 + (2^{1/2} \cos(\pi/4 - 162/5))/10, (88 \exp(-65))/5 - (127 \exp(-195/2))/10 + (2^{1/2} \cos(\pi/4 - 65/2))/10, (88 \exp(-326/5))/5 - (127 \exp(-489/5))/10 + (2^{1/2} \cos(\pi/4 - 163/5))/10, (88 \exp(-327/5))/5 - (127 \exp(-981/10))/10 + (2^{1/2} \cos(\pi/4 - 327/10))/10, (88 \exp(-328/5))/5 - (127 \exp(-492/5))/10 + (2^{1/2} \cos(\pi/4 - 164/5))/10, (88 \exp(-329/5))/5 - (127 \exp(-987/10))/10 + (2^{1/2} \cos(\pi/4 - 329/10))/10, (88 \exp(-66))/5 - (127 \exp(-99))/10 + (2^{1/2} \cos(\pi/4 - 33))/10, (88 \exp(-331/5))/5 - (127 \exp(-993/10))/10 + (2^{1/2} \cos(\pi/4 - 331/10))/10, (88 \exp(-332/5))/5 - (127 \exp(-498/5))/10 + (2^{1/2} \cos(\pi/4 - 166/5))/10, (88 \exp(-333/5))/5 - (127 \exp(-999/10))/10 + (2^{1/2} \cos(\pi/4 - 333/10))/10, (88 \exp(-334/5))/5 - (127 \exp(-501/5))/10 + (2^{1/2} \cos(\pi/4 - 167/5))/10, (88 \exp(-67))/5 - (127 \exp(-201/2))/10 + (2^{1/2} \cos(\pi/4 - 67/2))/10, (88 \exp(-336/5))/5 - (127 \exp(-504/5))/10 + (2^{1/2} \cos(\pi/4 - 168/5))/10, (88 \exp(-337/5))/5 - (127 \exp(-1011/10))/10 + (2^{1/2} \cos(\pi/4 - 337/10))/10, (88 \exp(-338/5))/5 - (127 \exp(-507/5))/10 + (2^{1/2} \cos(\pi/4 - 169/5))/10, (88 \exp(-339/5))/5 - (127 \exp(-1017/10))/10 + (2^{1/2} \cos(\pi/4 - 339/10))/10, (88 \exp(-68))/5 - (127 \exp(-102))/10 + (2^{1/2} \cos(\pi/4 - 34))/10, (88 \exp(-341/5))/5 - (127 \exp(-1023/10))/10 + (2^{1/2} \cos(\pi/4 - 341/10))/10, (88 \exp(-342/5))/5 - (127 \exp(-513/5))/10 + (2^{1/2} \cos(\pi/4 - 171/5))/10, (88 \exp(-343/5))/5 - (127 \exp(-1029/10))/10 + (2^{1/2} \cos(\pi/4 - 343/10))/10, (88 \exp(-344/5))/5 - (127 \exp(-516/5))/10 + (2^{1/2} \cos(\pi/4 - 172/5))/10, (88 \exp(-69))/5 - (127 \exp(-207/2))/10 + (2^{1/2} \cos(\pi/4 - 69/2))/10, (88 \exp(-346/5))/5 - (127 \exp(-519/5))/10 + (2^{1/2} \cos(\pi/4 - 173/5))/10, (88 \exp(-347/5))/5 - (127 \exp(-1041/10))/10 + (2^{1/2} \cos(\pi/4 - 347/10))/10, (88 \exp(-348/5))/5 - (127 \exp(-522/5))/10 + (2^{1/2} \cos(\pi/4 - 174/5))/10, (88 \exp(-349/5))/5 - (127 \exp(-1047/10))/10 + (2^{1/2} \cos(\pi/4 - 349/10))/10, (88 \exp(-70))/5 - (127 \exp(-105))/10 + (2^{1/2} \cos(\pi/4 - 35))/10, (88 \exp(-351/5))/5 - (127 \exp(-1053/10))/10 + (2^{1/2} \cos(\pi/4 - 351/10))/10, (88 \exp(-352/5))/5 - (127 \exp(-528/5))/10 + (2^{1/2} \cos(\pi/4 - 176/5))/10, (88 \exp(-353/5))/5 - (127 \exp(-1059/10))/10 + (2^{1/2} \cos(\pi/4 - 353/10))/10, (88 \exp(-354/5))/5 - (127 \exp(-531/5))/10 + (2^{1/2} \cos(\pi/4 - 177/5))/10, (88 \exp(-71))/5 - (127 \exp(-213/2))/10 + (2^{1/2} \cos(\pi/4 - 71/2))/10, (88 \exp(-356/5))/5 -$

$(88 \cdot \exp(-411/5))/5 - (127 \cdot \exp(-1233/10))/10 + (2^{1/2} \cdot \cos(\pi/4 - 411/10))/10, (88 \cdot \exp(-412/5))/5 - (127 \cdot \exp(-618/5))/10 + (2^{1/2} \cdot \cos(\pi/4 - 206/5))/10, (88 \cdot \exp(-413/5))/5 - (127 \cdot \exp(-1239/10))/10 + (2^{1/2} \cdot \cos(\pi/4 - 413/10))/10, (88 \cdot \exp(-414/5))/5 - (127 \cdot \exp(-621/5))/10 + (2^{1/2} \cdot \cos(\pi/4 - 207/5))/10, (88 \cdot \exp(-83))/5 - (127 \cdot \exp(-249/2))/10 + (2^{1/2} \cdot \cos(\pi/4 - 83/2))/10, (88 \cdot \exp(-416/5))/5 - (127 \cdot \exp(-624/5))/10 + (2^{1/2} \cdot \cos(\pi/4 - 208/5))/10, (88 \cdot \exp(-417/5))/5 - (127 \cdot \exp(-1251/10))/10 + (2^{1/2} \cdot \cos(\pi/4 - 417/10))/10, (88 \cdot \exp(-418/5))/5 - (127 \cdot \exp(-627/5))/10 + (2^{1/2} \cdot \cos(\pi/4 - 209/5))/10, (88 \cdot \exp(-419/5))/5 - (127 \cdot \exp(-1257/10))/10 + (2^{1/2} \cdot \cos(\pi/4 - 419/10))/10, (88 \cdot \exp(-84))/5 - (127 \cdot \exp(-126))/10 + (2^{1/2} \cdot \cos(\pi/4 - 42))/10, (88 \cdot \exp(-421/5))/5 - (127 \cdot \exp(-1263/10))/10 + (2^{1/2} \cdot \cos(\pi/4 - 421/10))/10, (88 \cdot \exp(-422/5))/5 - (127 \cdot \exp(-633/5))/10 + (2^{1/2} \cdot \cos(\pi/4 - 211/5))/10, (88 \cdot \exp(-423/5))/5 - (127 \cdot \exp(-1269/10))/10 + (2^{1/2} \cdot \cos(\pi/4 - 423/10))/10, (88 \cdot \exp(-424/5))/5 - (127 \cdot \exp(-636/5))/10 + (2^{1/2} \cdot \cos(\pi/4 - 212/5))/10, (88 \cdot \exp(-85))/5 - (127 \cdot \exp(-255/2))/10 + (2^{1/2} \cdot \cos(\pi/4 - 85/2))/10, (88 \cdot \exp(-426/5))/5 - (127 \cdot \exp(-639/5))/10 + (2^{1/2} \cdot \cos(\pi/4 - 213/5))/10, (88 \cdot \exp(-427/5))/5 - (127 \cdot \exp(-1281/10))/10 + (2^{1/2} \cdot \cos(\pi/4 - 427/10))/10, (88 \cdot \exp(-428/5))/5 - (127 \cdot \exp(-642/5))/10 + (2^{1/2} \cdot \cos(\pi/4 - 214/5))/10, (88 \cdot \exp(-429/5))/5 - (127 \cdot \exp(-1287/10))/10 + (2^{1/2} \cdot \cos(\pi/4 - 429/10))/10, (88 \cdot \exp(-86))/5 - (127 \cdot \exp(-129))/10 + (2^{1/2} \cdot \cos(\pi/4 - 43))/10, (88 \cdot \exp(-431/5))/5 - (127 \cdot \exp(-1293/10))/10 + (2^{1/2} \cdot \cos(\pi/4 - 431/10))/10, (88 \cdot \exp(-432/5))/5 - (127 \cdot \exp(-648/5))/10 + (2^{1/2} \cdot \cos(\pi/4 - 216/5))/10, (88 \cdot \exp(-433/5))/5 - (127 \cdot \exp(-1299/10))/10 + (2^{1/2} \cdot \cos(\pi/4 - 433/10))/10, (88 \cdot \exp(-434/5))/5 - (127 \cdot \exp(-651/5))/10 + (2^{1/2} \cdot \cos(\pi/4 - 217/5))/10, (88 \cdot \exp(-87))/5 - (127 \cdot \exp(-261/2))/10 + (2^{1/2} \cdot \cos(\pi/4 - 87/2))/10, (88 \cdot \exp(-436/5))/5 - (127 \cdot \exp(-654/5))/10 + (2^{1/2} \cdot \cos(\pi/4 - 218/5))/10, (88 \cdot \exp(-437/5))/5 - (127 \cdot \exp(-1311/10))/10 + (2^{1/2} \cdot \cos(\pi/4 - 437/10))/10, (88 \cdot \exp(-438/5))/5 - (12... Output truncated. Text exceeds maximum line length for Command Window display.$



QUESTION 2

```

commandwindow
clear
clc
close all
syms T1(t) T2(t)
dT2 = diff(T2,t)
dT1 = diff(T1,t)
g = [dT1 + (3*T2) == exp(-2*t) , dT2 - (3*T1) == exp(2*t)]
gcond = [T2(0) == 30 , T1(0) == 30]
d = dsolve(g,gcond)
T2 = d.T2
T1 = d.T1
pretty(T2)
pretty(T1)
tn = [0:0.1:3.5]
k1 = subs(T1,tn)
k2 = subs(T2,tn)
figure(1)
plot(tn,k1,tn,k2)

```

```

grid on
grid minor
axis tight
xlabel('Time(hour)')
ylabel('Temperature(degree celsius)')
legend('T1(degree celsius)', 'T2(degree celsius)')

```

results

dT2(t) =

diff(T2(t), t)

dT1(t) =

diff(T1(t), t)

g(t) =

[3*T2(t) + diff(T1(t), t) == exp(-2*t), diff(T2(t), t) -
3*T1(t) == exp(2*t)]

gcond =

[T2(0) == 30, T1(0) == 30]

d =

struct with fields:

T2: [1×1 sym]

T1: [1×1 sym]

T2 =

(3*exp(-2*t))/13 + (2*exp(2*t))/13 + (5*12170^(1/2)*cos(3*t -
atan(79/77)))/13

T1 =

(5*12170^(1/2)*cos(3*t + atan(77/79)))/13 - (3*exp(2*t))/13 -
(2*exp(-2*t))/13

$$\frac{\exp(-2t)^3}{13} + \frac{\exp(2t)^2}{13} + \frac{\sqrt{12170} \cos\left(\sqrt[3]{t} - \operatorname{atan}\left(\frac{\sqrt{79}}{\sqrt{77}}\right)\right)}{13}$$

$$\frac{\sqrt{12170} \cos\left(\sqrt[3]{t} + \operatorname{atan}\left(\frac{\sqrt{77}}{\sqrt{79}}\right)\right)}{13} - \frac{\exp(2t)^3}{13} - \frac{\exp(-2t)^2}{13}$$

tn =

Columns 1 through 12

	0	0.1000	0.2000	0.3000	0.4000	0.5000
0.6000	0.7000	0.8000	0.9000	1.0000	1.1000	

Columns 13 through 24

1.2000	1.3000	1.4000	1.5000	1.6000	1.7000
1.8000	1.9000	2.0000	2.1000	2.2000	2.3000

Columns 25 through 36

2.4000	2.5000	2.6000	2.7000	2.8000	2.9000
3.0000	3.1000	3.2000	3.3000	3.4000	3.5000

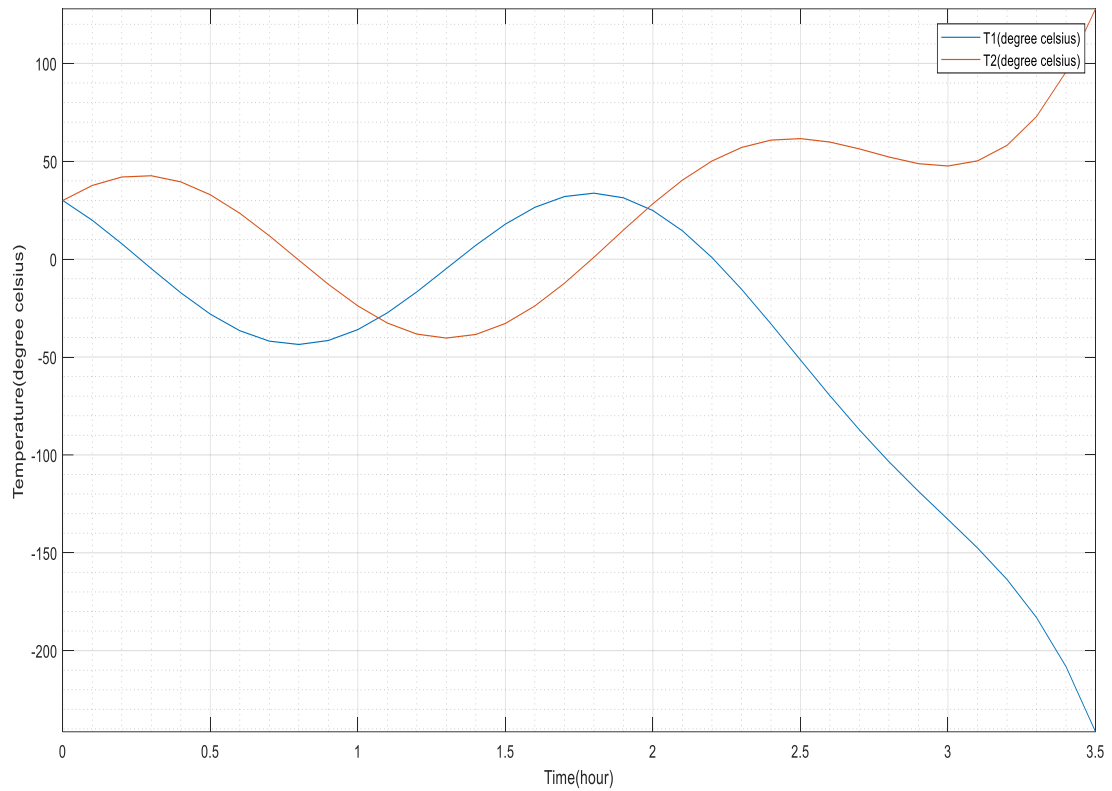
k1 =

```
[ 30, (5*12170^(1/2)*cos(atan(77/79) + 3/10))/13 -
(3*exp(1/5))/13 - (2*exp(-1/5))/13,
(5*12170^(1/2)*cos(atan(77/79) + 3/5))/13 - (3*exp(2/5))/13 -
(2*exp(-2/5))/13, (5*12170^(1/2)*cos(atan(77/79) + 9/10))/13 -
(3*exp(3/5))/13 - (2*exp(-3/5))/13,
(5*12170^(1/2)*cos(atan(77/79) + 6/5))/13 - (3*exp(4/5))/13 -
(2*exp(-4/5))/13, (5*12170^(1/2)*cos(atan(77/79) + 3/2))/13 -
(3*exp(1))/13 - (2*exp(-1))/13, (5*12170^(1/2)*cos(atan(77/79) +
9/5))/13 - (3*exp(6/5))/13 - (2*exp(-6/5))/13,
(5*12170^(1/2)*cos(atan(77/79) + 21/10))/13 - (3*exp(7/5))/13 -
(2*exp(-7/5))/13, (5*12170^(1/2)*cos(atan(77/79) + 12/5))/13 -
(3*exp(8/5))/13 - (2*exp(-8/5))/13,
(5*12170^(1/2)*cos(atan(77/79) + 27/10))/13 - (3*exp(9/5))/13 -
```

$(2*\exp(-9/5))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 3))/13 -$
 $(3*\exp(2))/13 - (2*\exp(-2))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) +$
 $33/10))/13 - (3*\exp(11/5))/13 - (2*\exp(-11/5))/13,$
 $(5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 18/5))/13 - (3*\exp(12/5))/13 -$
 $(2*\exp(-12/5))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 39/10))/13 -$
 $(3*\exp(13/5))/13 - (2*\exp(-13/5))/13,$
 $(5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 21/5))/13 - (3*\exp(14/5))/13 -$
 $(2*\exp(-14/5))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 9/2))/13 -$
 $(3*\exp(3))/13 - (2*\exp(-3))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) +$
 $24/5))/13 - (3*\exp(16/5))/13 - (2*\exp(-16/5))/13,$
 $(5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 51/10))/13 - (3*\exp(17/5))/13 -$
 $(2*\exp(-17/5))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 27/5))/13 -$
 $(3*\exp(18/5))/13 - (2*\exp(-18/5))/13,$
 $(5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 57/10))/13 - (3*\exp(19/5))/13 -$
 $(2*\exp(-19/5))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 6))/13 -$
 $(3*\exp(4))/13 - (2*\exp(-4))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) +$
 $63/10))/13 - (3*\exp(21/5))/13 - (2*\exp(-21/5))/13,$
 $(5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 33/5))/13 - (3*\exp(22/5))/13 -$
 $(2*\exp(-22/5))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 69/10))/13 -$
 $(3*\exp(23/5))/13 - (2*\exp(-23/5))/13,$
 $(5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 36/5))/13 - (3*\exp(24/5))/13 -$
 $(2*\exp(-24/5))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 15/2))/13 -$
 $(3*\exp(5))/13 - (2*\exp(-5))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) +$
 $39/5))/13 - (3*\exp(26/5))/13 - (2*\exp(-26/5))/13,$
 $(5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 81/10))/13 - (3*\exp(27/5))/13 -$
 $(2*\exp(-27/5))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 42/5))/13 -$
 $(3*\exp(28/5))/13 - (2*\exp(-28/5))/13,$
 $(5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 87/10))/13 - (3*\exp(29/5))/13 -$
 $(2*\exp(-29/5))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 9))/13 -$
 $(3*\exp(6))/13 - (2*\exp(-6))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) +$
 $93/10))/13 - (3*\exp(31/5))/13 - (2*\exp(-31/5))/13,$
 $(5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 48/5))/13 - (3*\exp(32/5))/13 -$
 $(2*\exp(-32/5))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 99/10))/13 -$
 $(3*\exp(33/5))/13 - (2*\exp(-33/5))/13,$
 $(5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 51/5))/13 - (3*\exp(34/5))/13 -$
 $(2*\exp(-34/5))/13, (5*12170^{(1/2)}*\cos(\operatorname{atan}(77/79) + 21/2))/13 -$
 $(3*\exp(7))/13 - (2*\exp(-7))/13]$

k2 =

$[30, (3*\exp(-1/5))/13 + (2*\exp(1/5))/13 +$
 $(5*12170^{(1/2)}*\cos(\operatorname{atan}(79/77) - 3/10))/13, (3*\exp(-2/5))/13 +$
 $(2*\exp(2/5))/13 + (5*12170^{(1/2)}*\cos(\operatorname{atan}(79/77) - 3/5))/13,$
 $(3*\exp(-3/5))/13 + (2*\exp(3/5))/13 +$
 $(5*12170^{(1/2)}*\cos(\operatorname{atan}(79/77) - 9/10))/13, (3*\exp(-4/5))/13 +$
 $(2*\exp(4/5))/13 + (5*12170^{(1/2)}*\cos(\operatorname{atan}(79/77) - 6/5))/13,$



QUESTION 3

```

commandwindow
clear
clc
syms I(t) L R E
df = [diff(I,t)*L + R*I == E]
dfcondition = [I(0) == 0]
dg = dsolve(df,dfcondition)
pretty(dg)

```

results

df(t) =

$$L \cdot \text{diff}(I(t), t) + R \cdot I(t) == E$$

dfcondition =

$$I(0) == 0$$

dg =

$(E - E \exp(-Rt/L))/R$

$$\frac{E - E \exp\left(-\frac{Rt}{L}\right)}{R}$$

QUESTION 4

```
commandwindow
```

```
clear
```

```
clc
```

```
syms t w a k
```

```
f = k*exp(-a*t)*cos(w*t)
```

```
fs = laplace(f)
```

```
pretty(fs)
```

results

f =

$k \exp(-a t) \cos(t w)$

fs =

$(k(a + s))/((a + s)^2 + w^2)$

$$\frac{k(a + s)}{(a + s)^2 + w^2}$$

QUESTION 5

```
commandwindow
```

```
clear
```

```
clc
```

```
syms s pi
```

```
f = pi/(s^2+(10*pi*s)+(24*pi^2))
```

```
bd = ilaplace(f)
```

```
pretty(bd)
```

RESULTS

f =

$$\pi/(s^2 + 10*\pi*s + 24*\pi^2)$$

bd =

$$\exp(-4*\pi*t)/2 - \exp(-6*\pi*t)/2$$

$$\exp(-4 \pi t) \quad \exp(-6 \pi t)$$

$$2 \quad 2$$