Assignment 8

Problem 6.7 – Numerical Solutions

$$A \xrightarrow{k_1} B \xrightarrow{k_0} C$$
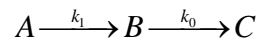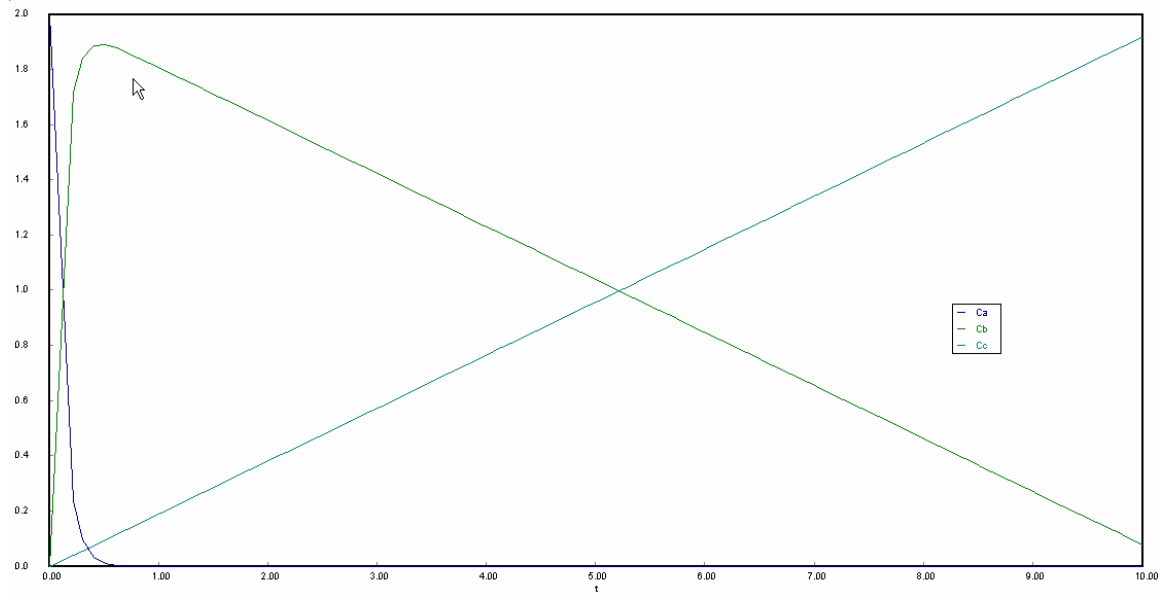
(a)(b)(c)

```
d(Ca)/d(t) = -k1 * Ca # in Stomach
Ca(0) = 2
d(Cb)/d(t) = k1 * Ca - k0 # in Blood
Cb(0) = 0
d(Cc)/d(t) = k0 # in wherever which is not important
Cc(0) = 0

k0 = 0.192
k1 = 10
t(0) = 0
t(f) = 10
```

(d)

```
d(Ca)/d(t) = -k1 * Ca # in Stomach
Ca(0) = 1
d(Cb)/d(t) = k1 * Ca - k0 # in Blood
Cb(0) = 0
d(Cc)/d(t) = k0 # in wherever which is not important
Cc(0) = 0

k0 = 0.192
k1 = 10
t(0) = 0
t(f) = 0.5
```
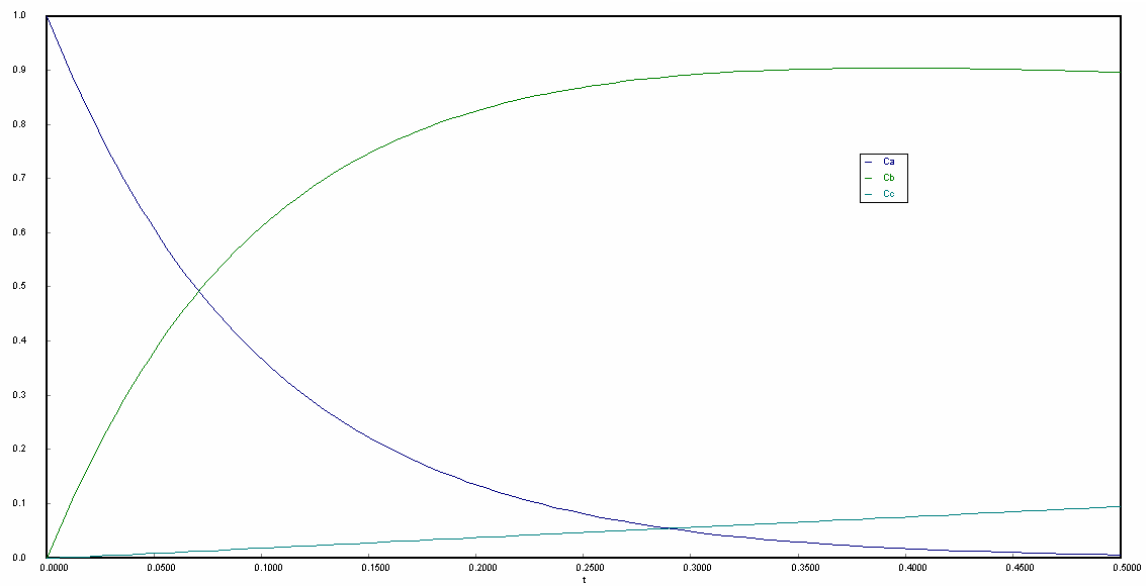
d(Ca)/d(t) = -k1 * Ca # in Stomach
Ca(0) = 1.0067379
d(Cb)/d(t) = k1 * Ca - k0 # in Blood
Cb(0) = 0.8972621
d(Cc)/d(t) = k0 # in wherever which is not important
Cc(0) = 0.096

k0 = 0.192
k1 = 10
t(0) = 0
t(f) = 9
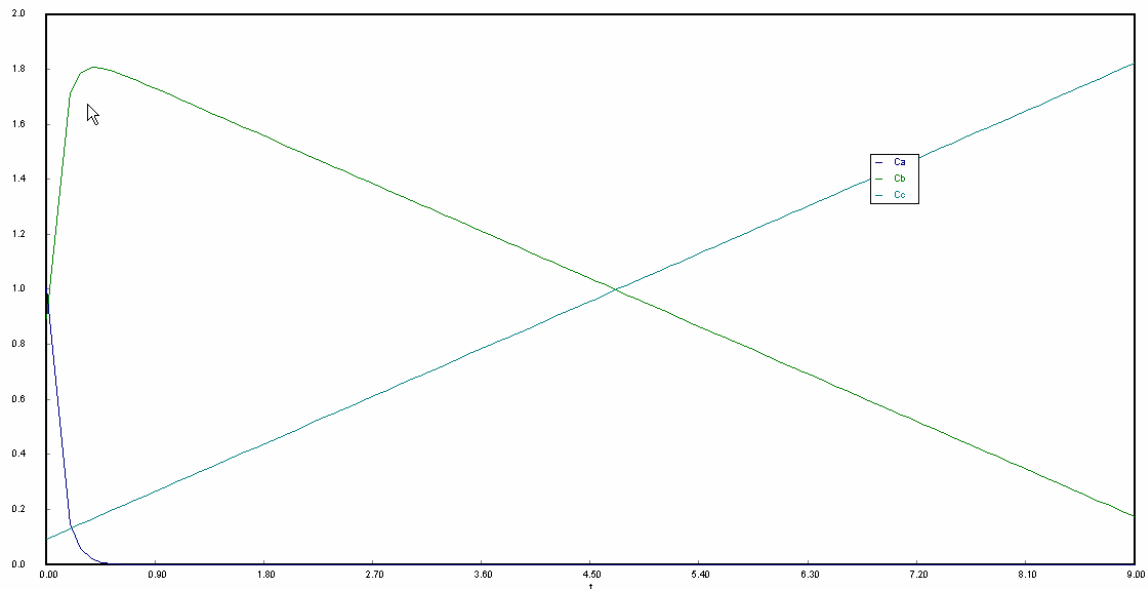
d(Ca)/d(t) = -k1 * Ca # in Stomach
Ca(0) = 2.0234759
d(Cb)/d(t) = k1 * Ca - k0 # in Blood
Cb(0) = 1.890524
d(Cc)/d(t) = k0 # in wherever which is not important
Cc(0) = 0.096

k0 = 0.192
k1 = 10
t(0) = 0
t(f) = 10
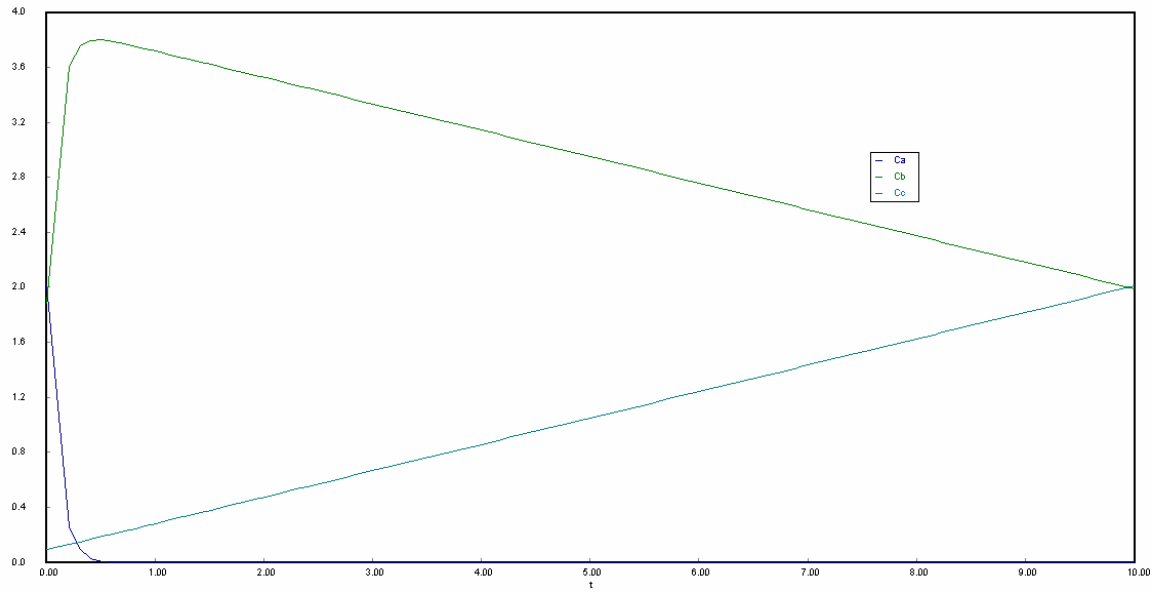
(e)

```
Fa0 = 40 # g/hr
V = 40 # liter
# Ca = Na/V # neglect the contribution from alchol
d(Na)/d(t) = V * (-k1 * Na / V) + Fa0 # in Stomach
Na(0) = 0
d(Nb)/d(t) = (k1 * Na / V - k0) * V # in Blood
Nb(0) = 0
d(Nc)/d(t) = k0 * V # in wherever which is not important
Nc(0) = 0

k0 = 0.192
k1 = 10
t(0) = 0
t(f) = 1
Ca = Na / V
Cb = Nb / V
Cc = Nc / V
```
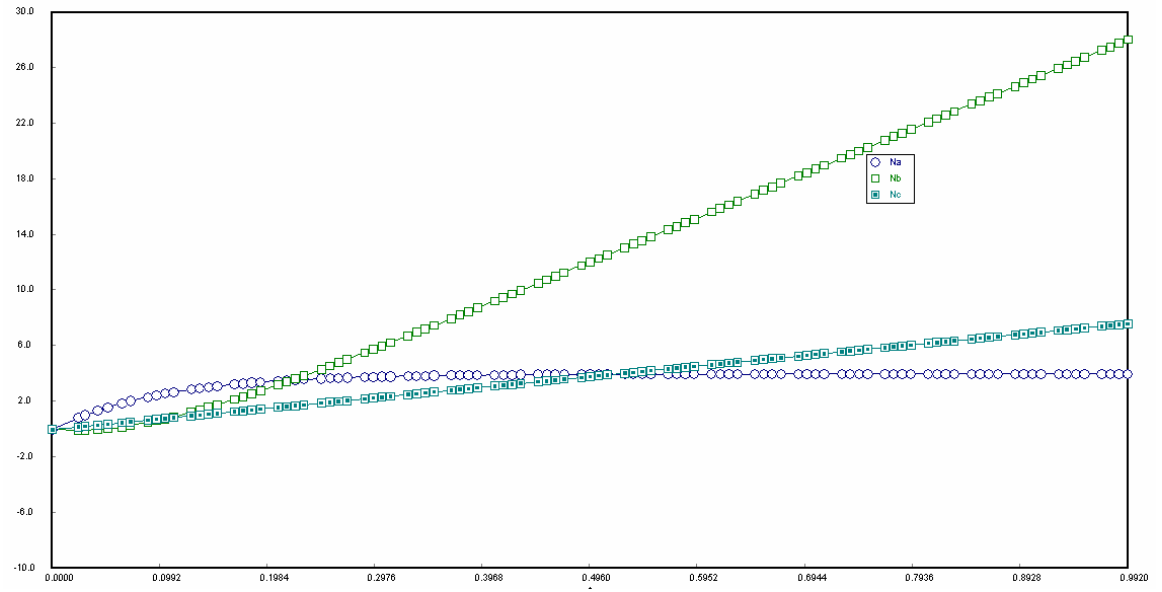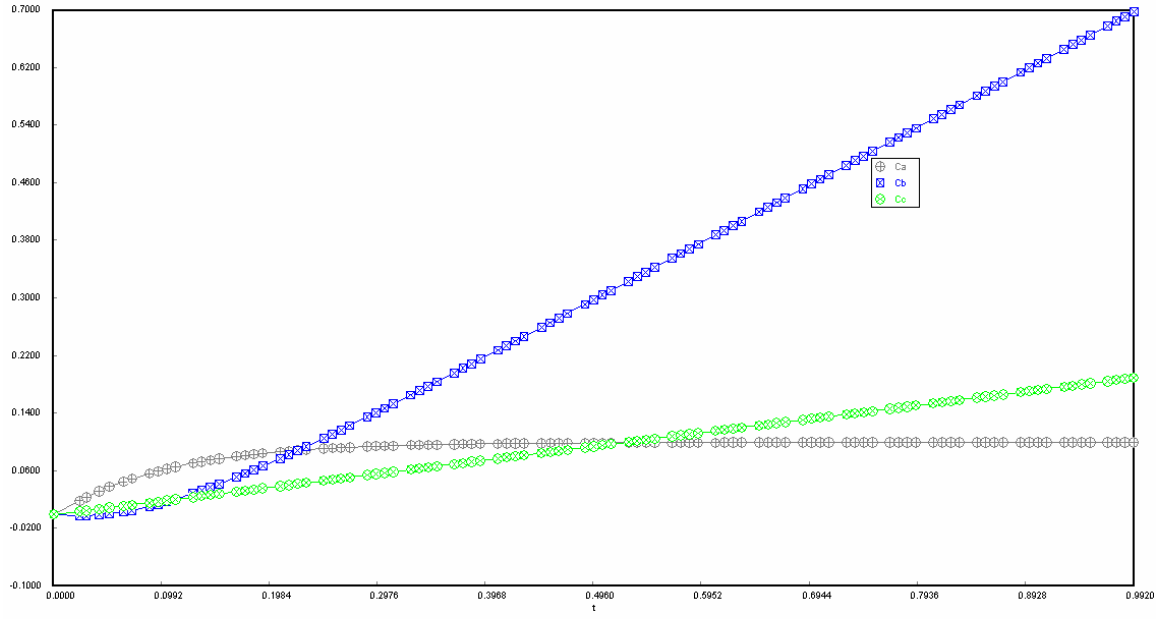
```
Fa0 = 40 # g/hr
V = 40 # liter
# Ca = Na/V # neglect the contribution from alchol
d(Na)/d(t) = V * (-k1 * Na / V) # in Stomach
Na(0) = 3.99818
d(Nb)/d(t) = (k1 * Na / V - k0) * V # in Blood
Nb(0) = 28.32018
d(Nc)/d(t) = k0 * V # in wherever which is not important
Nc(0) = 7.68

k0 = 0.192
k1 = 10
t(0) = 0
t(f) = 4
Ca = Na / V
Cb = Nb / V
Cc = Nc / V
```
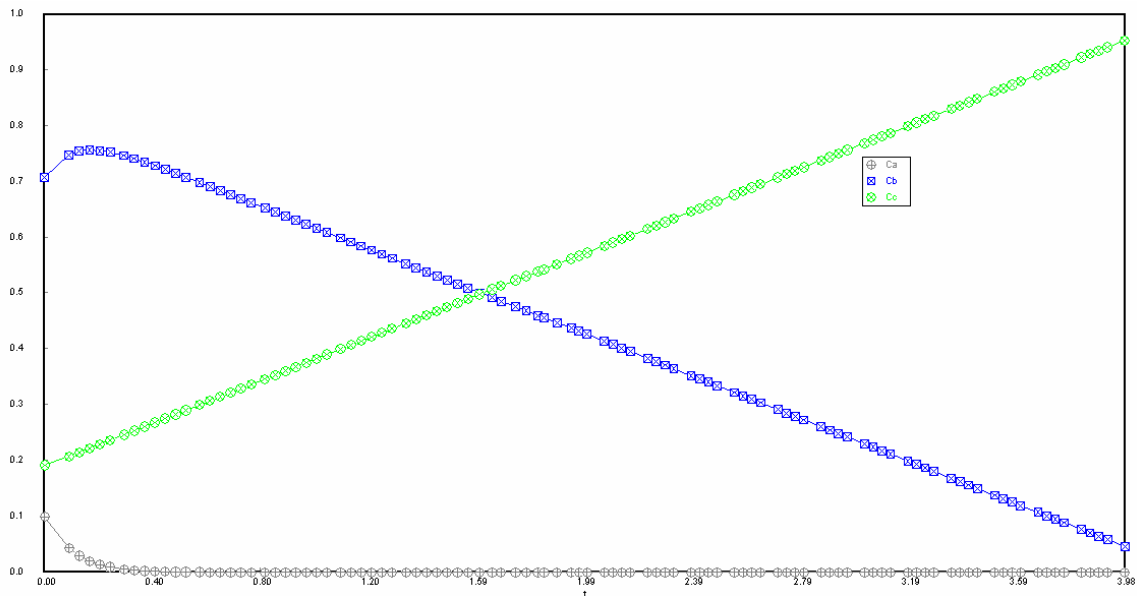

(a) ~6 hrs
(b) ~7.5hrs
(c) >10hrs
(d) US:~5.5hrs; Sweden:~8hrs; Russia:>10hrs
(e) US:~0hrs; Sweden:~1.5hrs; Russia:>4hrs

(f)

ODE Results Graph, Solution #33

d(Ca)/d(t) = -k1 * Ca # in Stomach
Ca(0) = 1.5
d(Cb)/d(t) = k1 * Ca - k0 # in Blood
Cb(0) = 0.
d(Cc)/d(t) = k0 # in wherever which is not important
Cc(0) = 0.

k0 = 0.192
k1 = 10
t(0) = 0
t(f) = 5

Differential Equations: 3   Auxiliary Equations: 2   ✔ Ready for solution

RKF45   ☐ Table   ☑ Graph

Ln 11   No File   No Title
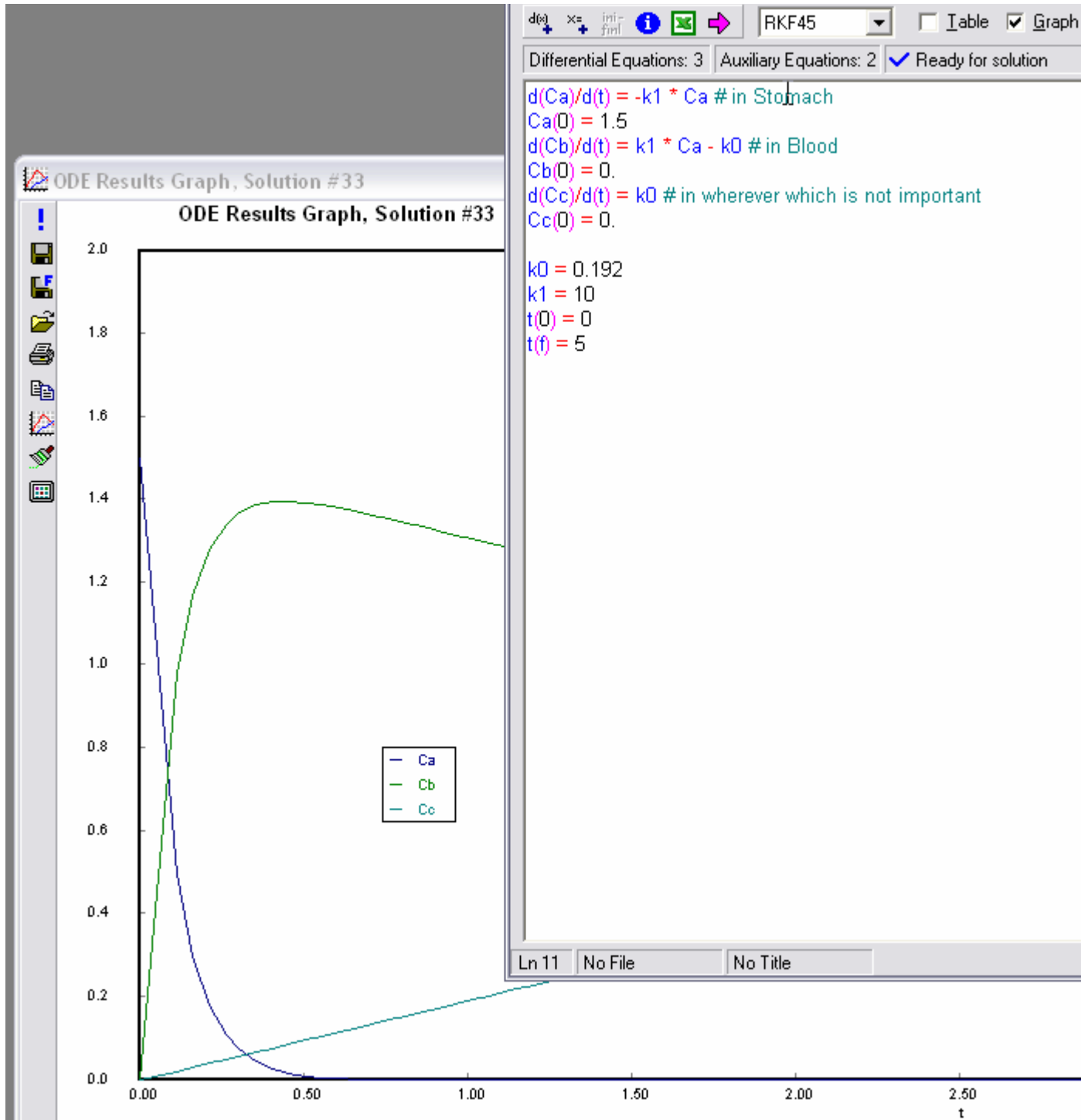
US: <5mins

(g) It depends on person's metabolism, but since thin person have small body volume so I expect it take long to wait till the level of alcohol in blood goes down to the intoxication level.

Problem 6.12

$A := 1$ $B := 2$

$C := 3$ $D := 4$

$$k1A := 7min^{-1} \quad k2D := 3\frac{liter^2}{mol^2 min} \quad k3E := 2\frac{liter}{mol \cdot min}$$

$$CA := 0.1\frac{mol}{liter} \quad CB := 0.93\frac{mol}{liter} \quad CC := 0.51\frac{mol}{liter} \quad CD := 0.049\frac{mol}{liter}$$

$r1A := -k1A \cdot CA$ $r2D := k2D \cdot CC^2 \cdot CA$ $r3E := k3E \cdot CD \cdot CC$

$r1B := \frac{1}{3} \cdot -r1A$ $r2C := \frac{-2}{3}r2D$ $r3D := \frac{-4}{3}r3E$

$r3C := r3D$

$r1C := r1B$ $r2A := \frac{-1}{3}r2D$

$r3A := 0$

$r1D := 0$

$r2B := 0$ $r3B := 0$

$r1E := 0$

$r2E := 0$

$$r1A = -11.667\frac{mol}{m^3 \cdot s} \qquad r1B = 3.889\frac{mol}{m^3 \cdot s} \qquad r1C = 3.889\frac{mol}{m^3 \cdot s}$$

$$r2A = -0.434\frac{mol}{m^3 \cdot s} \qquad r2B = 0 \qquad r2C = -0.867\frac{mol}{m^3 \cdot s}$$

$$r3B = 0$$

$$r3A = 0 \qquad\qquad\qquad\qquad\qquad\qquad r3C = -1.111\frac{mol}{m^3 \cdot s}$$

$$r1E = 0$$

$$r1D = 0$$

$$r2D = 1.3\frac{mol}{m^3 \cdot s} \qquad r2E = 0$$

$$r3E = 0.833\frac{mol}{m^3 \cdot s}$$

$$r3D = -1.111\frac{mol}{m^3 \cdot s}$$

$rA := r1A + r2A + r3A$

$rB := r1B + r2B + r3B$

$rC := r1C + r2C + r3C$

$rD := r1D + r2D + r3D$

$rE := r1E + r2E + r3E$

$rA = -12.1 \dfrac{mol}{m^3 \cdot s}$

$rB = 3.889 \dfrac{mol}{m^3 \cdot s}$

$rC = 1.911 \dfrac{mol}{m^3 \cdot s}$

$rD = 0.19 \dfrac{mol}{m^3 \cdot s}$

$$V = \frac{FA0 - FA}{-rA} \qquad\qquad CA0 := 3 \frac{mol}{liter} \qquad v0 := 100 \frac{liter}{min}$$

$$V := v0 \cdot \frac{CA0 - CA}{-rA} \qquad\qquad V = 399.444 L$$

(h)

```
# P6-12 (h)
# unit are all converted to time [=] min; volume [=] liter; mole
k1A = 7
k2D = 3
k3E = 2
r1A = -k1A * CA
r2D = k2D * CC ^ 2 * CA
r3E = k3E * CD * CC
rA = r1A - r2D / 3
rB = -r1A/3
rC = -r1A/3 - r2D / 3 * 2 - r3E
rD = r2D - r3E / 3 * 4
rE = r3E
V = 600
v0 = 100
tau = V / v0
CA0 = 3
CB0 = 0
CC0 = 0
CD0 = 0
CE0 = 0


f(CA) = (CA - CA0) - rA * tau
CA(0) = 3 > 0
f(CB) = (CB - CB0) - rB * tau
CB(0) = 0 > 0
f(CC) = (CC - CC0) - rC * tau
CC(0) = 0 > 0
f(CD) = (CD - CD0) - rD * tau
CD(0) = 0 > 0
f(CE) = (CE - CE0) - rE * tau
CE(0) = 0 > 0
```

POLYMATH Report   No Title
Nonlinear Equations   09-Apr-2006

Calculated values of NLE variables

	Variable	Value	f(x)	Initial Guess
1	CA	0.0672845	0	3.
2	CB	0.9419832	1.11E-16	0
3	CC	0.5142601	1.11E-16	0
4	CD	0.0347087	-6.939E-18	0
5	CE	0.2141915	-2.776E-17	0

	Variable	Value
1	k1A	7.
2	k2D	3.
3	k3E	2.
4	r1A	-0.4709916
5	r2D	0.0533829
6	r3E	0.0356986
7	rA	-0.4887859
8	rB	0.1569972
9	rC	0.08571
10	rD	0.0057848
11	rE	0.0356986
12	V	600.
13	v0	100.
14	tau	6.
15	CA0	3.
16	CB0	0
17	CC0	0
18	CD0	0
19	CE0	0

Nonlinear equations

1 f(CA) = (CA - CA0) - rA * tau = 0

2 f(CB) = (CB - CB0) - rB * tau = 0

3 f(CC) = (CC - CC0) - rC * tau = 0

4 f(CD) = (CD - CD0) - rD * tau = 0

5 f(CE) = (CE - CE0) - rE * tau = 0

Explicit equations

1 k1A = 7

2 k2D = 3

3 k3E = 2

4 r1A = -k1A * CA

5 r2D = k2D * CC ^ 2 * CA

6 r3E = k3E * CD * CC

7 rA = r1A - r2D / 3

8 rB = -r1A/3

9 rC = -r1A/3 - r2D / 3 * 2 - r3E

10	rD = r2D - r3E / 3 * 4
11	rE = r3E
12	V = 600
13	v0 = 100
14	tau = V / v0
15	CA0 = 3
16	CB0 = 0
17	CC0 = 0
18	CD0 = 0
19	CE0 = 0

Conditions for solution

CA	Absolutely Positive
CB	Absolutely Positive
CC	Absolutely Positive
CD	Absolutely Positive
CE	Absolutely Positive

General Settings

Total number of equations	24
Number of implicit equations	5
Number of explicit equations	19
Elapsed time	0.0000 sec
Solution method	CONSTRAINED
Convergence tolerance	0.0000001
Maxumum # of iterations	150
# of iterations used	6

Problem 6.14

```
# P6.14

# all units are consist as I did in P6.12

kD1 = 0.25
kE2 = 0.1
kF3 = 5
v0 = 10


rD1 = kD1 * CA * CB ^ 2
rE2 = kE2 * CA * CD
rF3 = kF3 * CB * CC ^ 2

rA = -rD1 - 3 * rE2
rB = -2 * rD1 - rF3
rC = rD1 + rE2 - 2 * rF3
rD = rD1 - 2 * rE2 + rF3
rE = rE2
rF = rF3

d(CA)/d(V) = rA / v0
CA(0) = 1.5
d(CB)/d(V) = rB / v0
CB(0) = 2
d(CC)/d(V) = rC / v0
CC(0) = 0
d(CD)/d(V) = rD / v0
CD(0) = 0
d(CE)/d(V) = rE / v0
CE(0) = 0
d(CF)/d(V) = rF / v0
CF(0) = 0
V(0) = 0
V(f) = 50
```
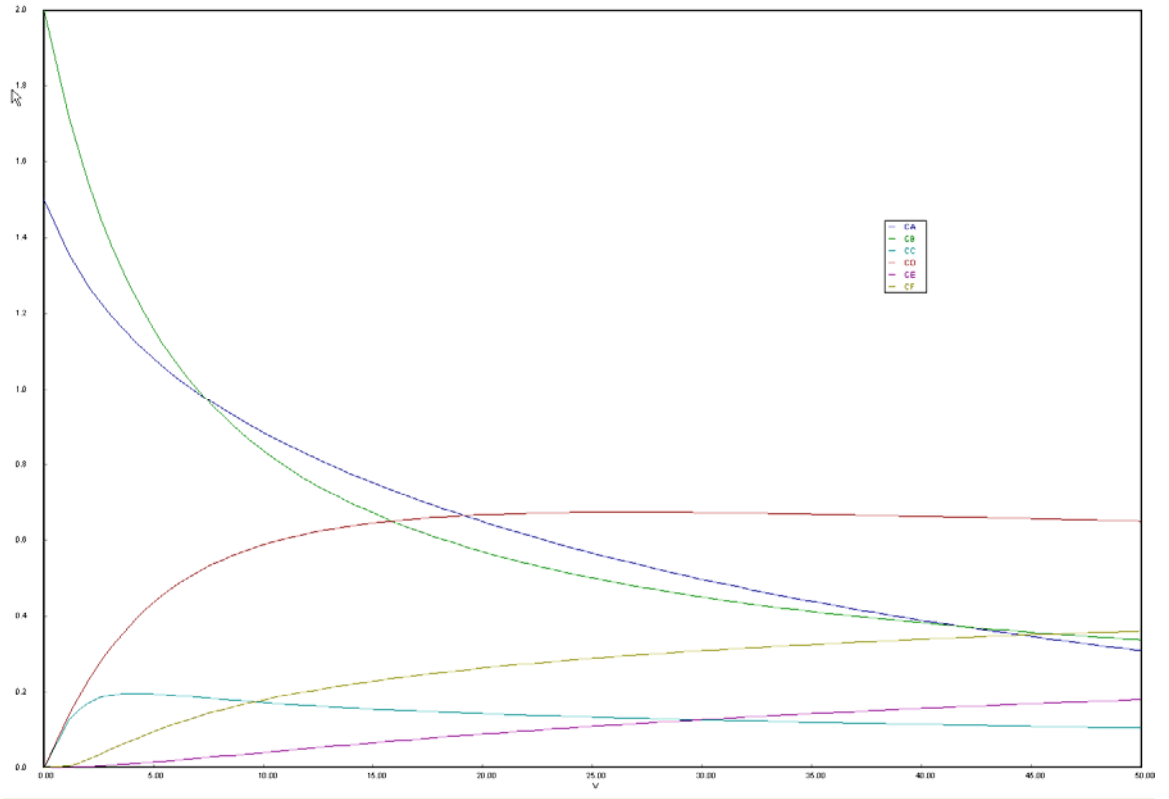
V	CA	CB	CC	CD	CE	CF	rA	rB	rC	rD	rE	rF
0	1.5	2	0	0	0	0	-1.5	-3	1.5	1.5	0	0
1.115956	1.359484	1.719705	0.125761	0.140938	0.001159	0.006218	-1.080344	-2.177723	0.789579	1.115714	0.018335	0.127047
1.52497	1.318291	1.635981	0.151796	0.184361	0.002051	0.012906	-0.972546	-1.984744	0.564961	1.035646	0.023449	0.180344
2.011653	1.274456	1.545921	0.172456	0.2319	0.003365	0.023179	-0.867062	-1.786173	0.361296	0.947802	0.028691	0.224193
2.595479	1.227874	1.449841	0.186837	0.283281	0.005248	0.037397	-0.765747	-1.578521	0.196621	0.846708	0.033934	0.250629
3.054248	1.194999	1.382406	0.19288	0.319517	0.006924	0.049136	-0.701002	-1.434804	0.112389	0.771161	0.037358	0.256948
3.584893	1.160314	1.312172	0.196218	0.357182	0.00904	0.062694	-0.638682	-1.28784	0.048477	0.689819	0.040661	0.254442
4.207453	1.123385	1.239015	0.197039	0.39609	0.011719	0.078069	-0.578874	-1.139185	0.003175	0.604084	0.043773	0.244076
4.56167	1.103902	1.201286	0.196574	0.415936	0.013321	0.086442	-0.549921	-1.064823	-0.013285	0.560133	0.045232	0.236371
5.350479	1.063819	1.125947	0.194152	0.454918	0.017046	0.103968	-0.494811	-0.919809	-0.035404	0.472844	0.047846	0.217262
5.750479	1.044992	1.091737	0.192492	0.472257	0.019002	0.112257	-0.470583	-0.854988	-0.041594	0.433301	0.048895	0.207193
6.150479	1.027034	1.059865	0.190675	0.488161	0.020992	0.120154	-0.448866	-0.796563	-0.045472	0.397459	0.049763	0.197407
6.550479	1.009859	1.030106	0.188768	0.502764	0.023011	0.127676	-0.429293	-0.743795	-0.047718	0.364973	0.050471	0.188035
7.350479	0.977575	0.976143	0.184853	0.528543	0.027111	0.141675	-0.395422	-0.652695	-0.049093	0.30876	0.051487	0.170771
7.750479	0.962347	0.951606	0.182901	0.539925	0.029184	0.148192	-0.380663	-0.613281	-0.04881	0.284444	0.051826	0.162911
8.150479	0.947661	0.928507	0.180976	0.55042	0.031267	0.154415	-0.367108	-0.577346	-0.048137	0.262308	0.052071	0.155552
8.550479	0.933475	0.906723	0.179088	0.560108	0.033356	0.160362	-0.354611	-0.544504	-0.0472	0.242125	0.052232	0.148673
9.350479	0.906459	0.866667	0.17545	0.577334	0.037542	0.171503	-0.332303	-0.486793	-0.044872	0.206833	0.052343	0.136245
9.750479	0.893566	0.848209	0.173707	0.584991	0.039635	0.176729	-0.322295	-0.461371	-0.043595	0.191385	0.052309	0.130636
10.15048	0.881047	0.830689	0.172015	0.592081	0.041723	0.181746	-0.31294	-0.437925	-0.042291	0.177209	0.052225	0.125391
10.55048	0.868879	0.814036	0.170375	0.59865	0.043807	0.186566	-0.304172	-0.416257	-0.040987	0.16418	0.052095	0.120484
11.35048	0.845514	0.783081	0.16725	0.610386	0.047953	0.195665	-0.288166	-0.377576	-0.038436	0.141132	0.051723	0.111579
11.75048	0.83428	0.768668	0.165762	0.615624	0.050013	0.199967	-0.280833	-0.360271	-0.03721	0.130926	0.051488	0.107533
12.15048	0.823324	0.7549	0.16432	0.620485	0.052062	0.204116	-0.273891	-0.344157	-0.036025	0.121492	0.051226	0.103732
12.55048	0.812631	0.741734	0.162925	0.624996	0.054099	0.208123	-0.267307	-0.329127	-0.034884	0.112761	0.05094	0.100155
13.35048	0.791985	0.71705	0.160264	0.633072	0.058137	0.215739	-0.255091	-0.301946	-0.032738	0.097162	0.050307	0.093607
13.75048	0.782008	0.705463	0.158994	0.63668	0.060135	0.219364	-0.249409	-0.289632	-0.031735	0.090188	0.049965	0.090606
14.15048	0.772248	0.694339	0.157763	0.640029	0.06212	0.222875	-0.24398	-0.278075	-0.030776	0.083704	0.049609	0.087769
14.55048	0.762696	0.683649	0.156569	0.643136	0.064089	0.226278	-0.238786	-0.267215	-0.029862	0.077669	0.04924	0.085084
15.35048	0.744182	0.663473	0.154283	0.648691	0.067982	0.232785	-0.229036	-0.247365	-0.028158	0.066801	0.048472	0.080125
15.75048	0.735204	0.653941	0.153188	0.651168	0.069905	0.235899	-0.22445	-0.238281	-0.027365	0.061907	0.048075	0.077832
16.15048	0.726402	0.644752	0.152124	0.653462	0.071812	0.238925	-0.220039	-0.229701	-0.02661	0.057334	0.047672	0.075653
16.55048	0.71777	0.635888	0.151088	0.655585	0.073703	0.241868	-0.215791	-0.221588	-0.025891	0.053059	0.047262	0.073579
17.35048	0.700992	0.619065	0.149098	0.65936	0.077434	0.247522	-0.207748	-0.206631	-0.024551	0.045314	0.046431	0.069719
17.75048	0.692834	0.611076	0.14814	0.661033	0.079274	0.250238	-0.203933	-0.199728	-0.023928	0.041805	0.04601	0.067921
18.15048	0.684824	0.603348	0.147207	0.662574	0.081098	0.252887	-0.200246	-0.193174	-0.023334	0.038515	0.045587	0.066203
18.55048	0.676957	0.59587	0.146296	0.663991	0.082904	0.255469	-0.196679	-0.186946	-0.022766	0.035429	0.045162	0.064561
19.35048	0.661632	0.581613	0.144539	0.666486	0.086466	0.260448	-0.189879	-0.17538	-0.021708	0.029812	0.04431	0.061483
19.75048	0.654167	0.574812	0.14369	0.667576	0.088222	0.26285	-0.186634	-0.170005	-0.021214	0.027255	0.043884	0.06004
20.15048	0.646827	0.568217	0.142861	0.66857	0.08996	0.265196	-0.183485	-0.164879	-0.020742	0.024852	0.043458	0.058656
20.55048	0.63961	0.561817	0.142049	0.669474	0.091681	0.267489	-0.180428	-0.159987	-0.02029	0.022592	0.043032	0.057326
21.35048	0.625529	0.54957	0.140477	0.671032	0.095073	0.271924	-0.17457	-0.150848	-0.019445	0.018464	0.042186	0.054822
21.75048	0.618658	0.543706	0.139715	0.671695	0.096743	0.27407	-0.171762	-0.146576	-0.019048	0.016579	0.041765	0.053641
22.15048	0.611897	0.538007	0.138968	0.672287	0.098397	0.27617	-0.169029	-0.142487	-0.018669	0.014804	0.041346	0.052503
22.55048	0.605242	0.532464	0.138236	0.672813	0.100034	0.278227	-0.166368	-0.13857	-0.018305	0.013131	0.040929	0.051408
23.35048	0.592241	0.521822	0.136813	0.673678	0.103259	0.282214	-0.16125	-0.131215	-0.017621	0.010068	0.040103	0.049333
23.75048	0.585889	0.516711	0.136121	0.674025	0.104847	0.284148	-0.158787	-0.12776	-0.0173	0.008667	0.039694	0.048349
24.15048	0.579634	0.511733	0.135441	0.674319	0.106418	0.286044	-0.156384	-0.124442	-0.016991	0.007345	0.039288	0.0474
24.55048	0.573472	0.506883	0.134773	0.674563	0.107974	0.287904	-0.15404	-0.121253	-0.016694	0.006099	0.038885	0.046482
25.35048	0.561421	0.497545	0.133472	0.674912	0.111037	0.291517	-0.149516	-0.115241	-0.016134	0.003813	0.038088	0.044737
25.75048	0.555528	0.493049	0.132837	0.675023	0.112545	0.293273	-0.147333	-0.112403	-0.015869	0.002765	0.037695	0.043906
26.15048	0.54972	0.488662	0.132212	0.675094	0.114037	0.294997	-0.145199	-0.109671	-0.015614	0.001777	0.037305	0.043102
26.55048	0.543995	0.48438	0.131598	0.675128	0.115514	0.29669	-0.143114	-0.10704	-0.015369	0.000844	0.036919	0.042323
27.35048	0.532789	0.476118	0.130396	0.675092	0.118421	0.299987	-0.13908	-0.102057	-0.014904	-0.000867	0.036156	0.040835
27.75048	0.527303	0.47213	0.129809	0.675026	0.119852	0.301592	-0.137128	-0.099696	-0.014683	-0.001651	0.035781	0.040125
28.15048	0.521895	0.468233	0.12923	0.674931	0.121269	0.303169	-0.135218	-0.097418	-0.014471	-0.002391	0.035409	0.039436
28.55048	0.516561	0.464424	0.128659	0.674807	0.12267	0.30472	-0.133348	-0.095219	-0.014265	-0.003089	0.035041	0.038766
29.35048	0.506111	0.457058	0.127542	0.674483	0.12543	0.307744	-0.129724	-0.09104	-0.013875	-0.004369	0.034315	0.037484
29.75048	0.500992	0.453496	0.126994	0.674284	0.126788	0.309219	-0.127967	-0.089054	-0.013689	-0.004955	0.033958	0.03687
30.15048	0.495942	0.450011	0.126454	0.674064	0.128133	0.310669	-0.126245	-0.087133	-0.013509	-0.005507	0.033605	0.036272
30.55048	0.49096	0.4466	0.12592	0.673823	0.129463	0.312097	-0.124558	-0.085274	-0.013335	-0.006028	0.033255	0.035691
31.35048	0.481192	0.439991	0.124874	0.673283	0.132082	0.314885	-0.121282	-0.081733	-0.013003	-0.006981	0.032568	0.034575
31.75048	0.476405	0.436789	0.12436	0.672987	0.133371	0.316247	-0.119691	-0.080045	-0.012844	-0.007417	0.032229	0.034038
32.15048	0.47168	0.433653	0.123852	0.672674	0.134647	0.317587	-0.11813	-0.07841	-0.012691	-0.007826	0.031895	0.033516
32.55048	0.467015	0.43058	0.12335	0.672345	0.135909	0.318908	-0.116599	-0.076824	-0.012542	-0.008212	0.031564	0.033007
33.35048	0.457867	0.424616	0.122364	0.671646	0.138395	0.321489	-0.113623	-0.073795	-0.012256	-0.008915	0.030913	0.032027
33.75048	0.45338	0.421722	0.12188	0.671276	0.139619	0.322751	-0.112175	-0.072347	-0.01212	-0.009235	0.030593	0.031554
34.15048	0.448949	0.418885	0.1214	0.670895	0.14083	0.323995	-0.110754	-0.070942	-0.011987	-0.009535	0.030277	0.031094
34.55048	0.444575	0.416102	0.120926	0.670502	0.142029	0.325221	-0.109358	-0.069578	-0.011858	-0.009817	0.029964	0.030644
35.35048	0.43599	0.410693	0.119992	0.669686	0.144389	0.32762	-0.106642	-0.066965	-0.01161	-0.010328	0.029349	0.029777
35.75048	0.431777	0.408064	0.119532	0.669264	0.145551	0.328795	-0.105319	-0.065714	-0.011491	-0.010558	0.029047	0.029358
36.15048	0.427616	0.405484	0.119077	0.668833	0.146701	0.329953	-0.104019	-0.064497	-0.011375	-0.010777	0.028748	0.028949
36.55048	0.423506	0.402952	0.118627	0.668394	0.147839	0.331095	-0.102742	-0.063314	-0.011262	-0.010975	0.028453	0.028549
37.35048	0.415437	0.398023	0.117739	0.667494	0.15008	0.333332	-0.100253	-0.061044	-0.011045	-0.011336	0.027873	0.027776
37.75048	0.411475	0.395625	0.117302	0.667034	0.151184	0.334428	-0.09904	-0.059954	-0.01094	-0.011498	0.027588	0.027402
38.15048	0.407561	0.393269	0.116868	0.666568	0.152276	0.335509	-0.097848	-0.058893	-0.010838	-0.011648	0.027306	0.027036
38.55048	0.403694	0.390955	0.116438	0.666097	0.153357	0.336577	-0.096675	-0.05786	-0.010739	-0.011786	0.027028	0.026679
39.35048	0.396098	0.386446	0.115591	0.665139	0.155487	0.338669	-0.094387	-0.055874	-0.010546	-0.012032	0.026481	0.025986
39.75048	0.392367	0.384249	0.115173	0.664653	0.156535	0.339695	-0.093271	-0.054919	-0.010454	-0.012139	0.026212	0.02565
40.15048	0.38868	0.382089	0.114758	0.664164	0.157573	0.340708	-0.092173	-0.053988	-0.010363	-0.012238	0.025946	0.025321
40.55048	0.385036	0.379966	0.114347	0.663671	0.1586	0.341708	-0.091092	-0.053081	-0.010274	-0.012328	0.025684	0.024999
41.35048	0.377876	0.375825	0.113536	0.662675	0.160624	0.34367	-0.088983	-0.051333	-0.010103	-0.012482	0.025168	0.024375
41.75048	0.374358	0.373805	0.113135	0.662173	0.161621	0.344633	-0.087953	-0.050491	-0.01002	-0.012548	0.024915	0.024072
42.15048	0.37088	0.371818	0.112737	0.661669	0.162607	0.345584	-0.086939	-0.049669	-0.009939	-0.012606	0.024664	0.023775
42.55048	0.367442	0.369864	0.112343	0.661163	0.163584	0.346524	-0.085941	-0.048867	-0.009859	-0.012658	0.024417	0.023484
43.35048	0.360684	0.366047	0.111564	0.660145	0.165508	0.348368	-0.083991	-0.04732	-0.009705	-0.012742	0.02393	0.022918
43.75048	0.357363	0.364184	0.111178	0.659634	0.166456	0.349274	-0.083039	-0.046575	-0.00963	-0.012775	0.023691	0.022643
44.15048	0.354079	0.362351	0.110796	0.659122	0.167394	0.350169	-0.082101	-0.045844	-0.009557	-0.012802	0.023455	0.022374
44.55048	0.350832	0.360545	0.110417	0.658609	0.168323	0.351053	-0.081177	-0.045131	-0.009485	-0.012823	0.023222	0.022109
45.35048	0.344446	0.357018	0.109666	0.657581	0.170153	0.352791	-0.07937	-0.043755	-0.009345	-0.012852	0.022763	0.021594
45.75048	0.341307	0.355294	0.109295	0.657067	0.171054	0.353645	-0.078486	-0.04309	-0.009278	-0.012859	0.022538	0.021344
46.15048	0.338202	0.353596	0.108927	0.656552	0.171947	0.354489	-0.077616	-0.04244	-0.009211	-0.012861	0.022315	0.021098
46.55048	0.335132	0.351924	0.108561	0.656038	0.172831	0.355323	-0.076758	-0.041804	-0.009146	-0.01286	0.022095	0.020857
47.35048	0.329092	0.348654	0.107837	0.65501	0.174572	0.356963	-0.075081	-0.040574	-0.009018	-0.012845	0.021662	0.020387
47.75048	0.326121	0.347055	0.107479	0.654497	0.17543	0.35777	-0.07426	-0.039978	-0.008957	-0.012832	0.02145	0.020158
48.15048	0.323183	0.345479	0.107123	0.653984	0.17628	0.358567	-0.073451	-0.039396	-0.008896	-0.012815	0.02124	0.019933
48.55048	0.320277	0.343926	0.106769	0.653473	0.177121	0.359356	-0.072653	-0.038826	-0.008836	-0.012795	0.021032	0.019712
49.35048	0.314559	0.340886	0.10607	0.652452	0.178779	0.360907	-0.071092	-0.037721	-0.008719	-0.012747	0.020624	0.019282
49.75048	0.311746	0.339399	0.105723	0.651943	0.179596	0.36167	-0.070328	-0.037186	-0.008662	-0.012718	0.020424	0.019072
50	0.310006	0.338482	0.105508	0.651626	0.180102	0.362141	-0.069482	-0.036598	-0.008599	-0.012683	0.020201	0.01884