Introduction to Scientific, Symbolic and Graphical Computation

Scientific Computation:

- numerical solution of scientific problems

Symbolic Computation:

- computation with *implicit* representations

Graphical Computation:

- visualisation of problems and solutions using computer graphics

The three together make up *mathematical computation*

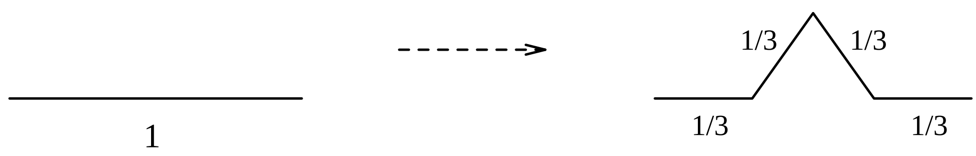
Themes

How can we represent a lot by a little?

How can we do a lot with a little?

Approach

- symbolic computation to prototype behaviour
- computer graphics to visualise results
- numerical methods for efficient/accurate implementations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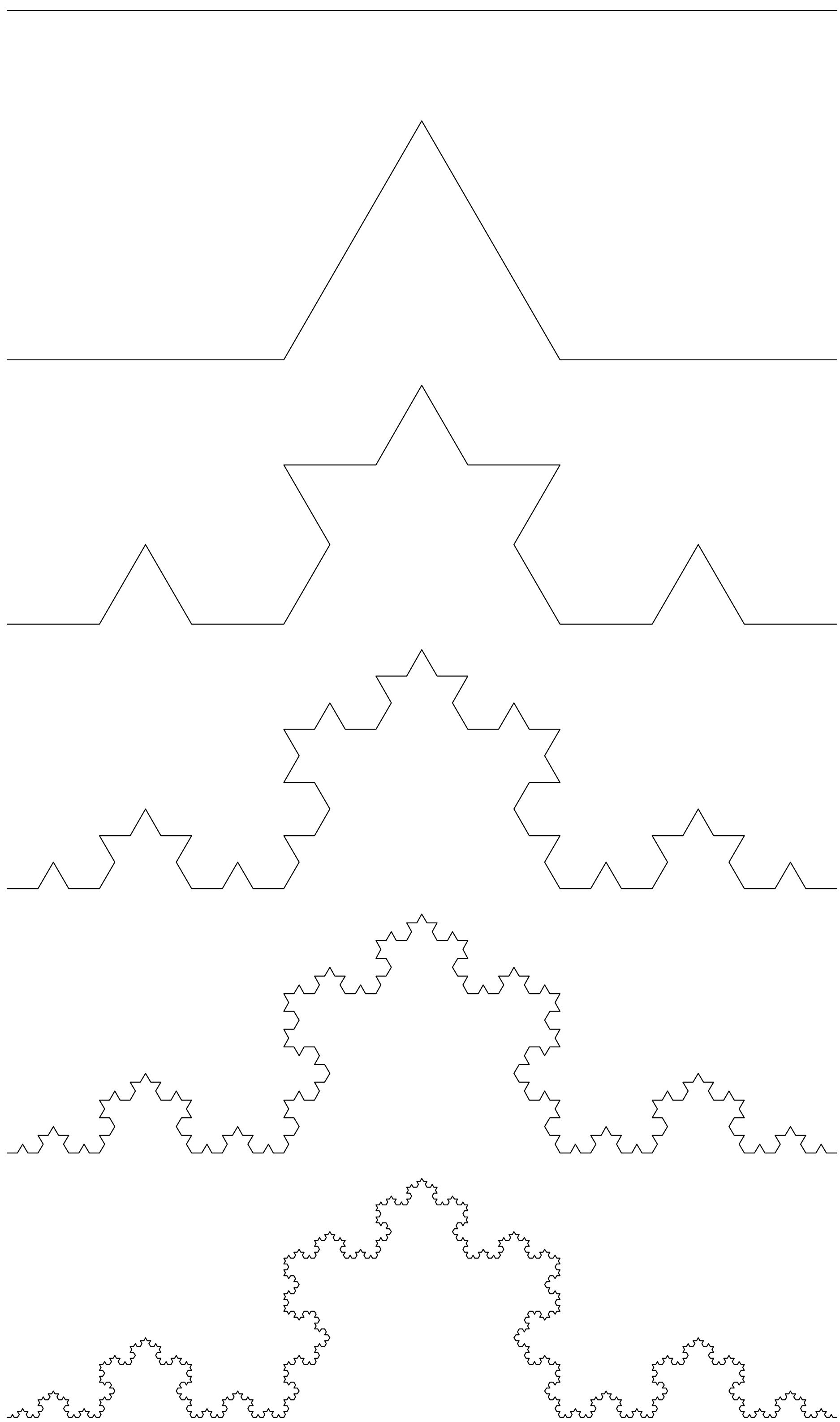
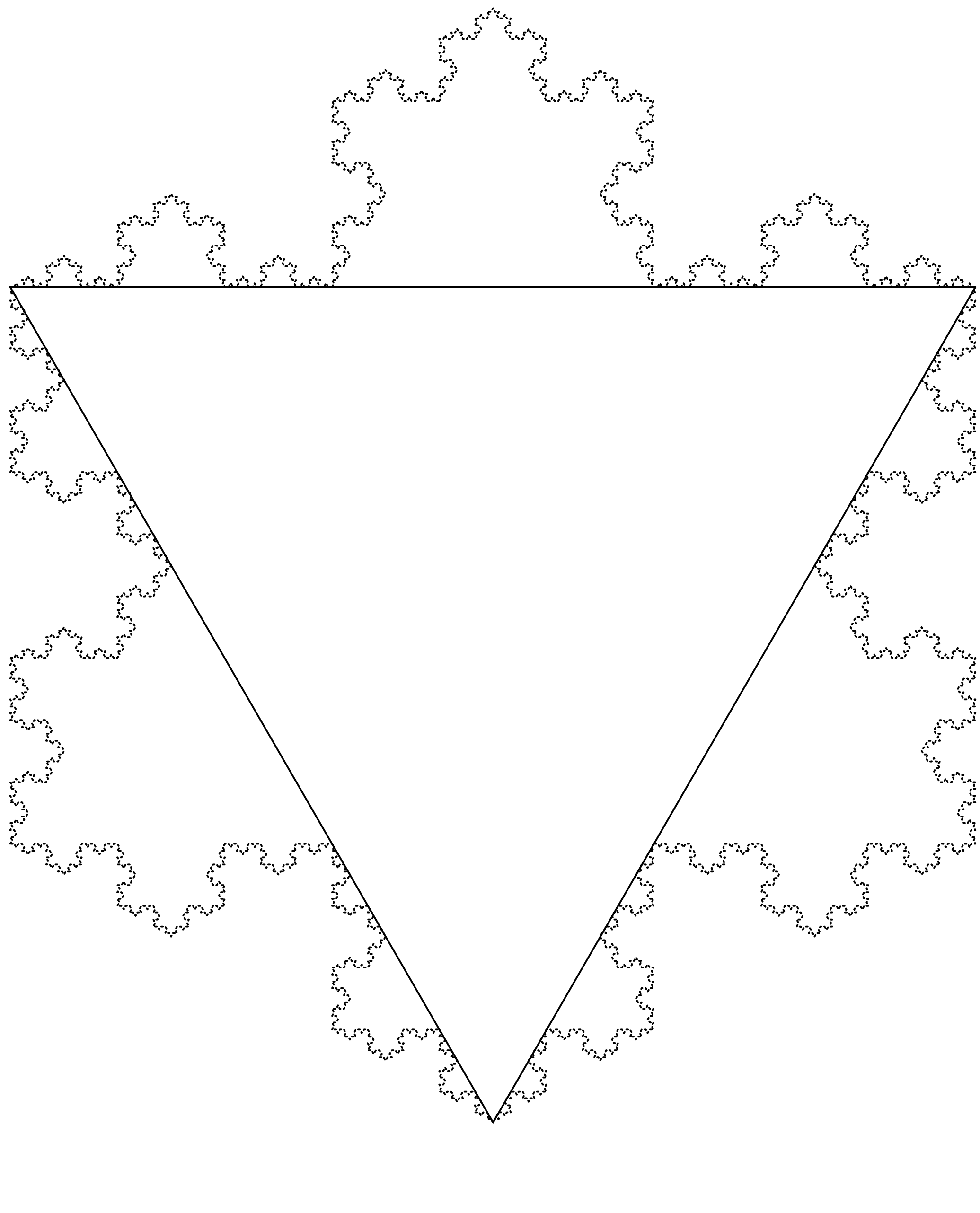
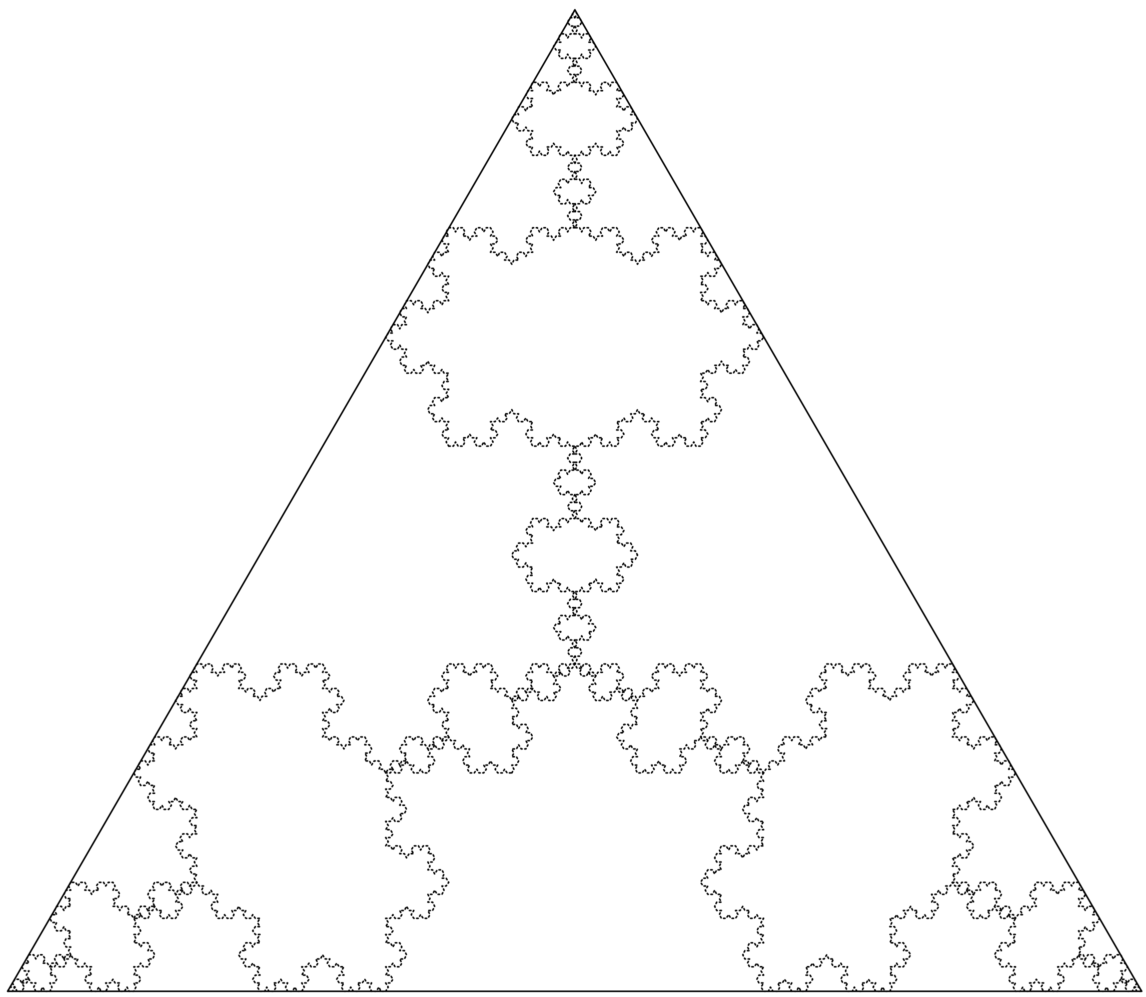
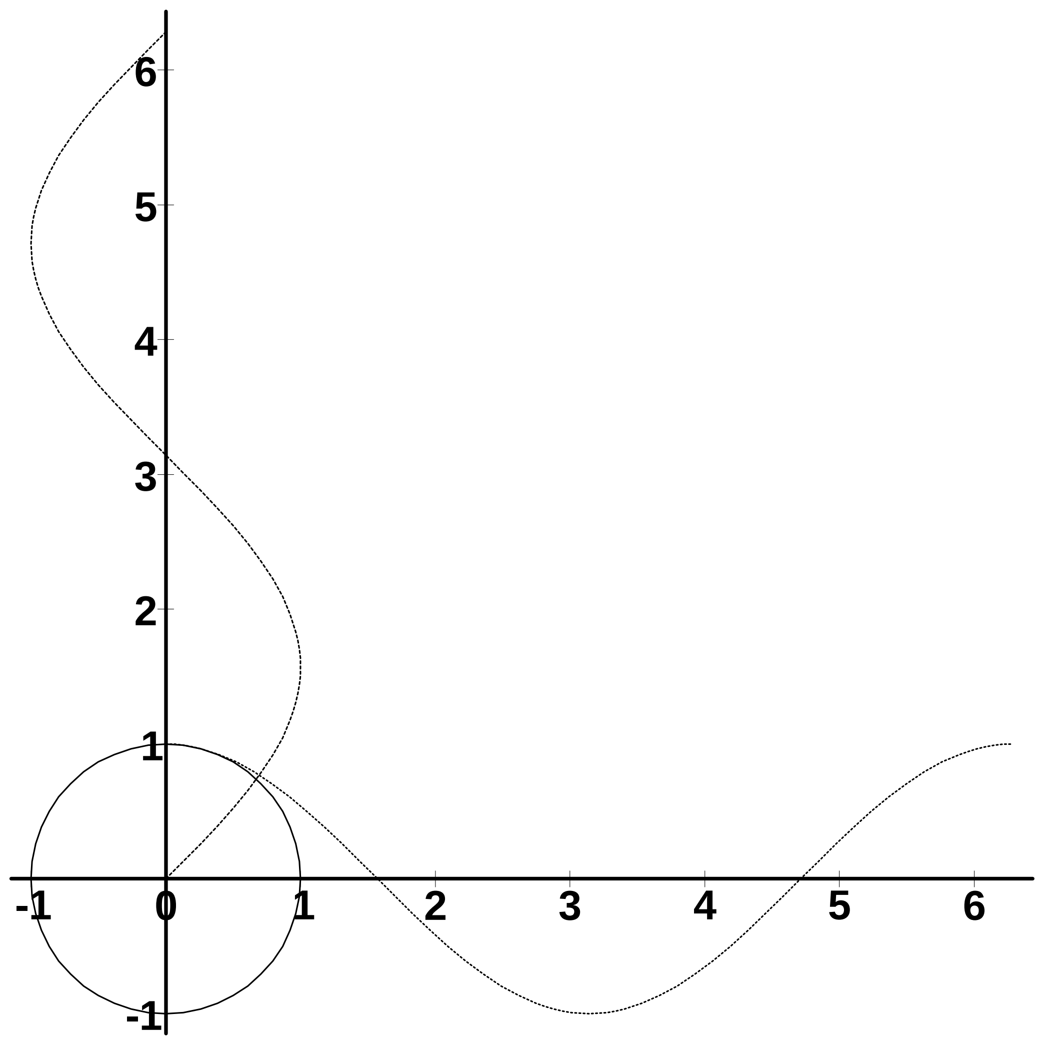
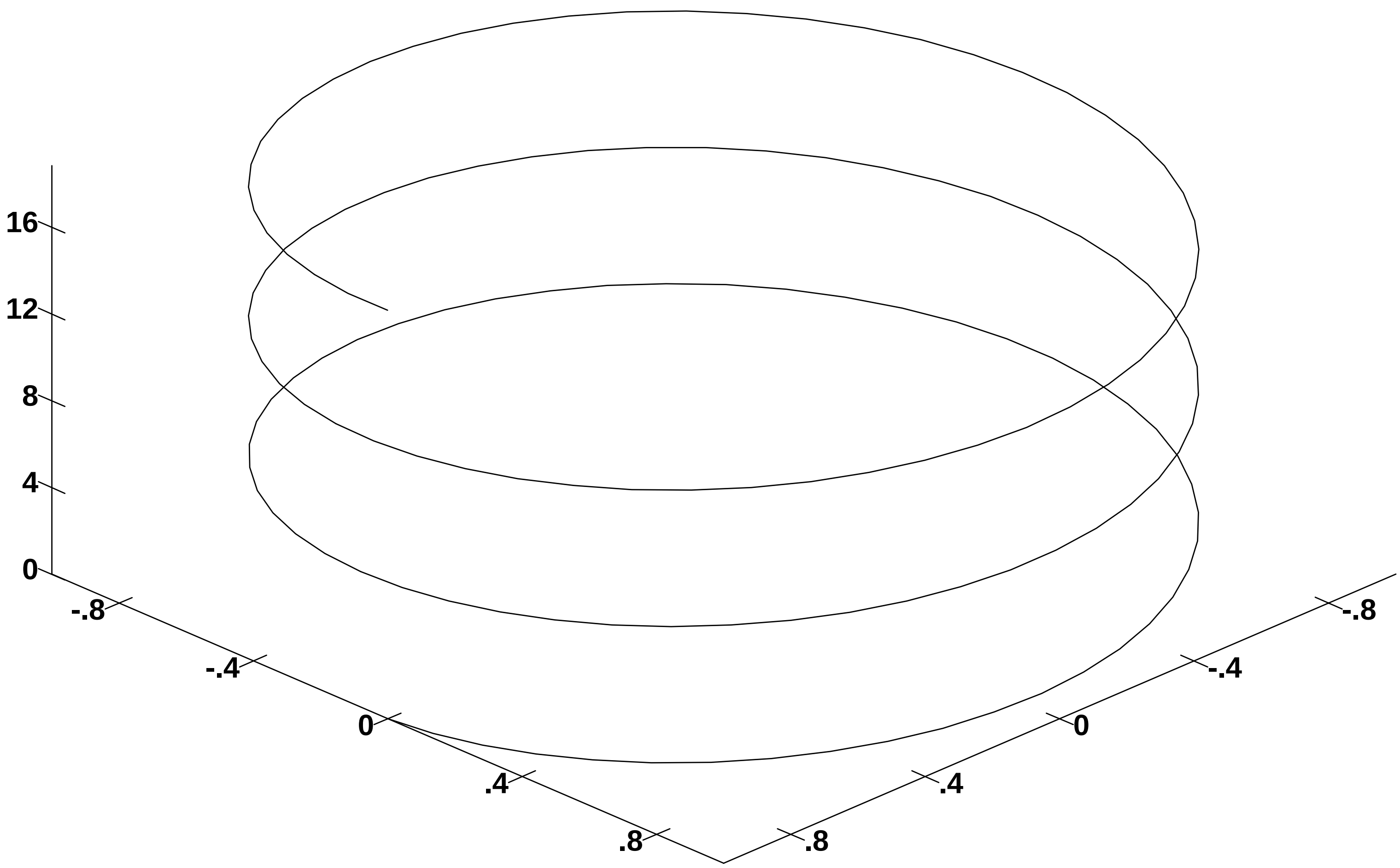
1/3
1
1/3
1/3

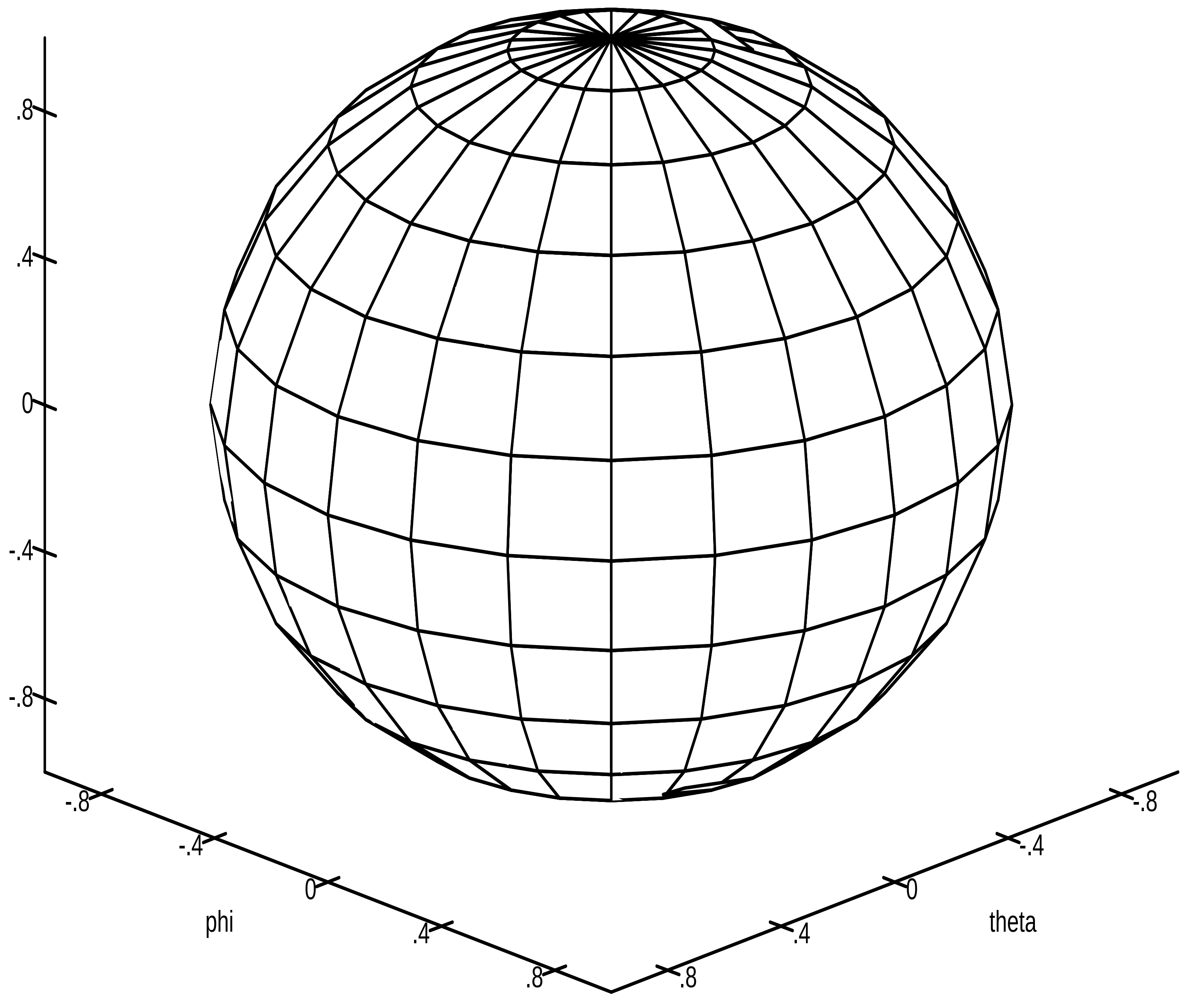


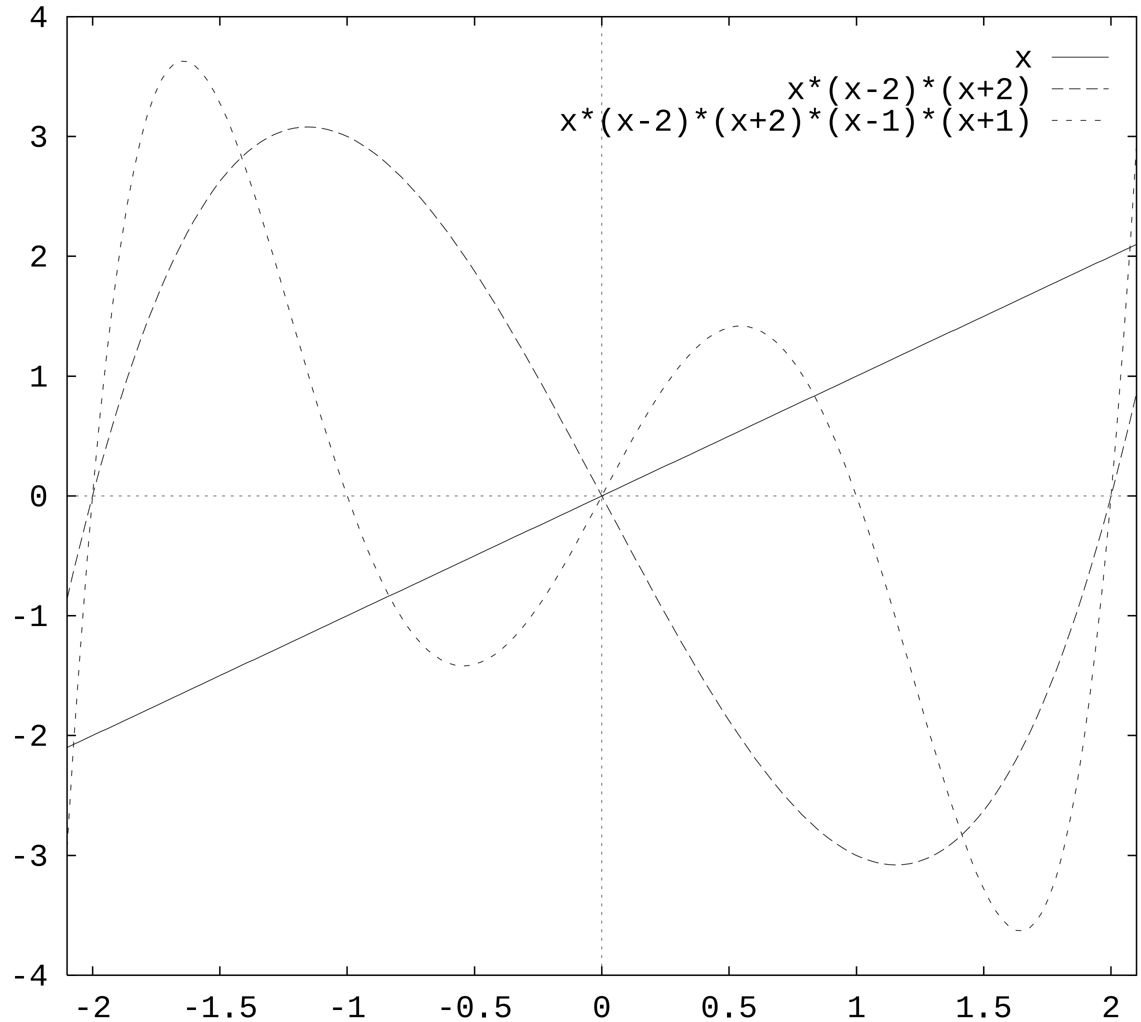


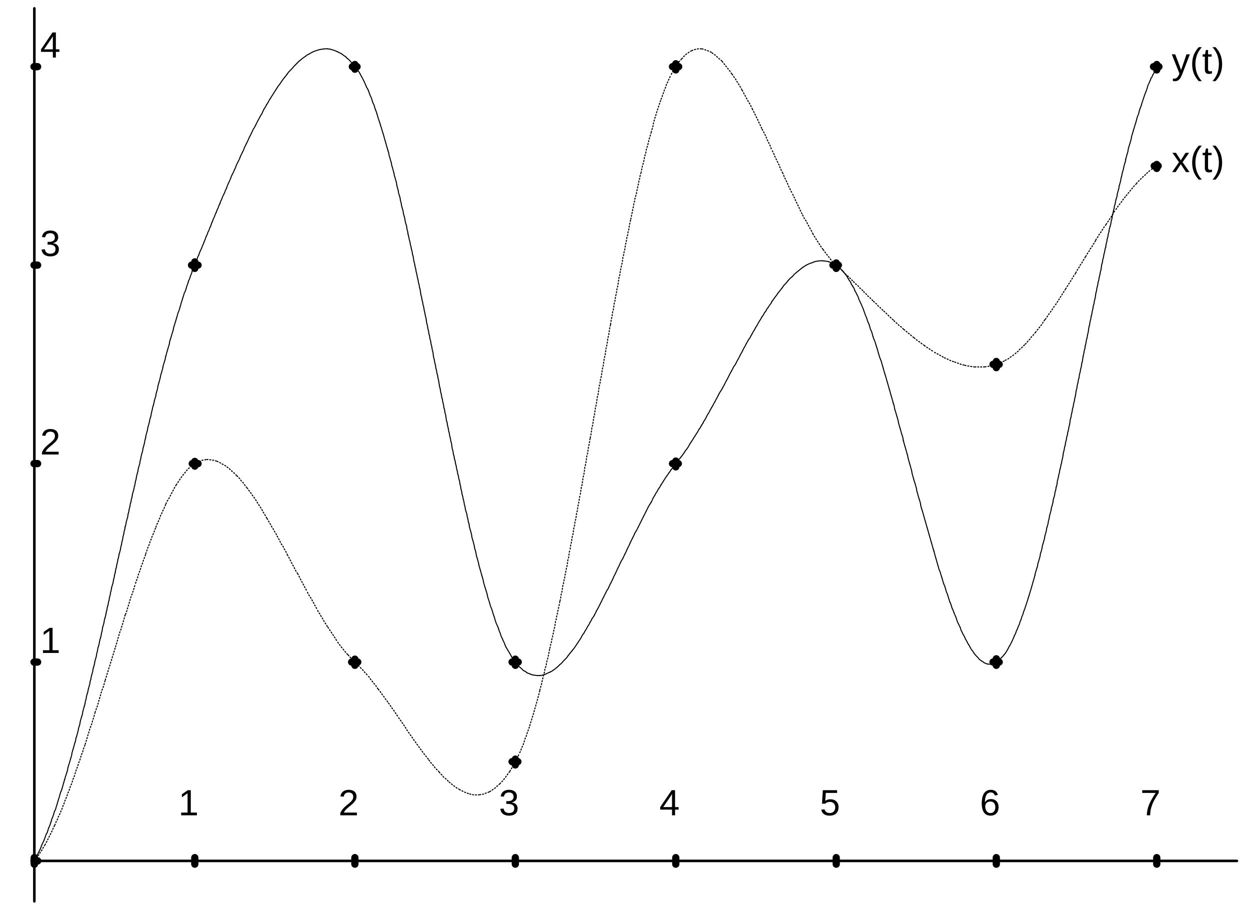


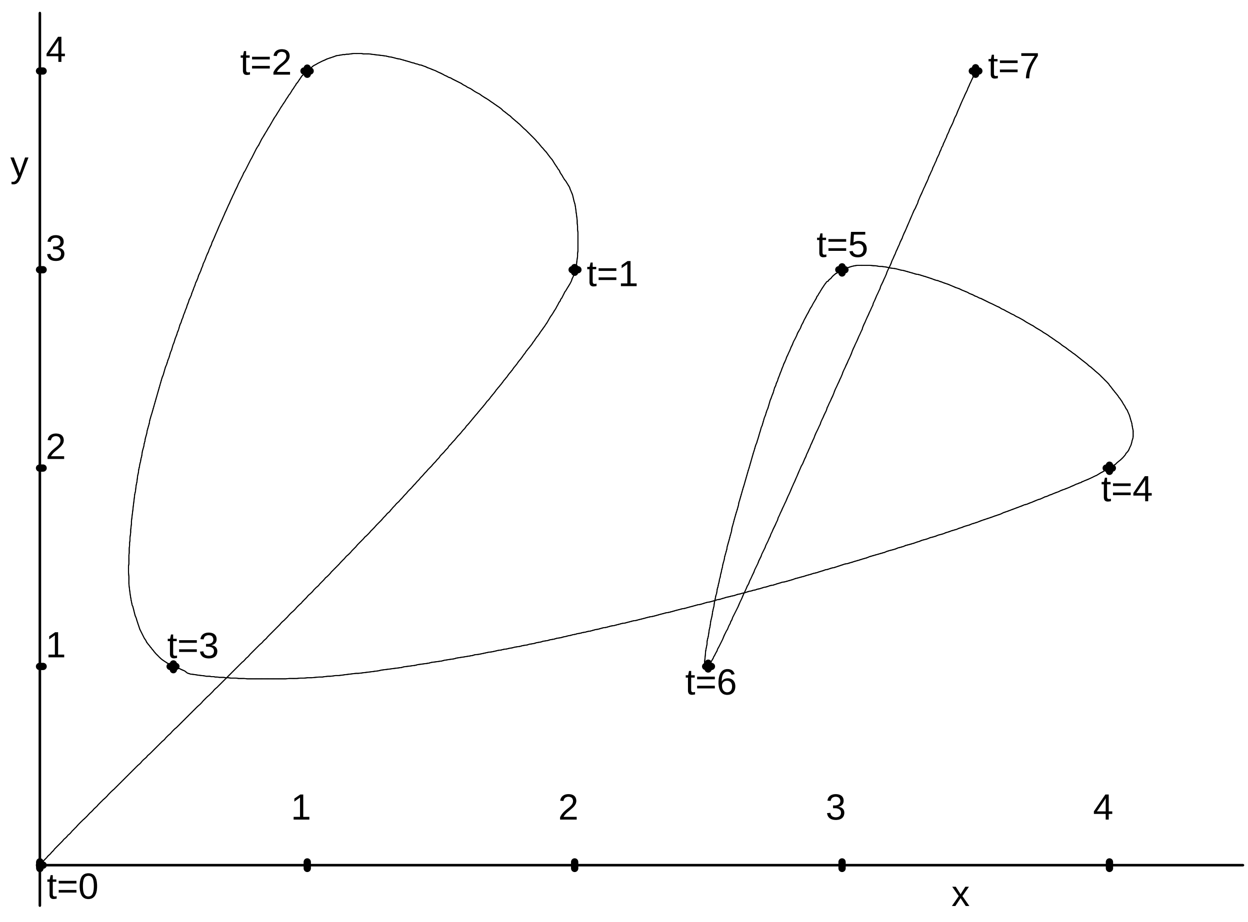

6
5
4
3
2
1
-1
0
1
2
3
4
5
6
-1


16
12
8
4
0
-.8
-.4
0
.4
.8
.8
.4
0
-.4
-.8


.8
.4
0
-.4
-.8
-.8
-.4
0
.4
.8
phi
.8
.4
0
-.4
-.8
theta


x
x*(x-2)*(x+2)
x*(x-2)*(x+2)*(x-1)*(x+1)
4
3
2
1
0
-1
-2
-3
-4
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2


4
3
2
1
1
2
3
4
5
6
7
y(t)
x(t)


y
x
4
3
2
1
1
2
3
4
t=0
t=1
t=2
t=3
t=4
t=5
t=6
t=7