Numerical Algorithms – Complexity W4241
C4

- Carry out the dartboard experiment (for computing π) on a computer. Try for $n = 1000i,\ \ i = 1, 2, \dots$ for as high i as your computer "permits".
- Let x_i be the successive estimates of π. What are the values of $|x_i - \pi|$?
- Do the errors ($|x_i - \pi|$) decrease proportionately to $n^{-1/2}$?

PP2

- Let $f_i(x_1, x_2, x_3), i = 1, 2, 3$ be functions of three variables (x_1, x_2, x_3) for which you know the values of $\int_0^1 \int_0^1 \int_0^1 f_i(x_1, x_2, x_3) dx_1 dx_2 dx_3$ *exactly*. Choose *different* functions.

C5 (20 points)

- Write a program to compute integrals in d dimensions, over the unit cube, by Monte-Carlo. You can use a pseudo-random generator that comes with your computer software, or write your own.
- Test on the three functions of PP2 (above). Print the error after $n = 1000i, i = 1, 2, \dots$ evaluations. Is the error decreasing proportionately to $n^{-1/2}$?