Math 331, Fall 2004, Due Monday, Nov 15

1. Suppose that a turtle is moving with constant velocity 1 unit/sec. The turtle is told, every second, to steer right by an amount equal to t^2 degrees, where t is the time (in secs). (For example, after the first step, it turns right 1 degree, then after the second, turn right by 4 degrees, and so on.) Draw the curve the turtle describes after 10 and after 100 seconds.

2. Consider the recursively defined sequence $S_n = S_{n-1}^2 - 4S_{n-1} + 6$ for $n \geq 1$, with $S_0 = 5$. Implement this in Maple using both a recursive and a non-recursive procedure. [*Hint for the computation of the non-recursive formula: complete the square.*]

   Extra credit: rewrite the recursive procedure adding `option remember` and see the difference in terms of computational speed.

3. By using only `TurtleCmd`, draw a random walk of n steps. (In a random walk the turtle takes a step forward, backwards, to the right, to the left, with equal probabilities, and then repeats the process.) [*Check* `rand`.]

4. Construct a Cantor set whose box counting dimension is 1/2. Explain a general algorithm for constructing a Cantor set with *any* given box dimension $0 < d < 1$. [*You can do this on Maple or by hand.*]

5. Write a TurtleCmd procedure that draws the n-th approximation of a fractal of your choice (not one saw in class) and calculate its box-counting dimension.