experimental mathematics with MAPLE

Help with exercises for chapter 5

Exercise 5.2.

(*c*) You should prove this part without resorting to floating-point calculations. Make use of the fact that the square of $\sqrt{2}$ is equal to 2, an integer. (Why is β not rational? Theorem 5, at the bottom of page 101, will give you the answer.)

(*d*) Perform the first couple of steps by hand.

Exercise 5.3. The idea is to get rid of the pre-periodic part of α, by *shifting* the decimal digits to the left. If you shift by the right amount, then the pre-periodic part will all be on the left of the decimal point.

Exercise 5.4. Warm-up with an easy case, such as $\alpha = 0.007007007007007\ldots$. You will have to sum a series.

Exercise 5.7. Treat $\sqrt{2}$ and $\sqrt{3}$ separately.

Exercise 5.9. For inspiration, see bottom of page 108.

Exercise 5.10. When comparing distances, the only difficulty is to persuade Maple to evaluate boolean functions.

Exercise 5.11.

(*a*) Recall that a circle is the locus of the points equidistant from the centre.

(*b*) Rephrase the question in terms of distances. Note that in a recursive sequence, you will have to compute the terms one at a time, and then check.

Exercise 5.12. Fix $n = 3$, and draw the points z_0, z_1, z_2 on the complex plane (use the formula at the top of page 108, if necessary). Try to understand the whole problem with this example, then deal with the general case.

Exercise 5.13. A good drawing will clarify a lot of things.