experimental mathematics with MAPLE

Help with exercises for chapter 4

Exercise 4.1.

(*c*) In parts (*ii*) and (*iv*), concentrate on the numerator, which is n. If you can construct the sequence of numerators, you have solved the problem. In part (*ii*) remember that $a^2/b^2 = (a/b)^2$.

Exercise 4.2.

(*a*) Clearly, there should be a `seq` in the function definition.

(*c*) The equality of the two sets can (and should) be checked without displaying any data.

Exercise 4.3. The set of squares less than 100 is $S = \{0, 1, 4, 9, \ldots, 81\}$. The set of (non-negative) cubes in the same range is $C = \{0, 1, 8, 27, 64\}$. The squares which are not cubes is $S \setminus C$. Determine what this set is, by hand, and then verify your calculations with Maple. If it works, do it for 5000.

Exercise 4.6.

(*a*) Various sequences need to be considered here

`n`	0	1	2	3
`a(n)`	17	19	23	29
`isprime(a(n))`	*true*	*true*	*true*	*true*
`not isprime(a(n))`	*false*	*false*	*false*	*false*

Do you see what you should be looking for?

(*b*) The boolean sequence relevant to this problem will evaluate to *true* when a_n is prime and $a_n > M$.

Exercise 4.7.

(*b*) If you think of sequences as functions, that is, think of a_n as $a(n)$, then the sequence ζ becomes the function of a function. The simple device of changing from sequence (i.e., subscript) to function notation, is the key to deal with problems of this kind

$$\zeta(n) = \Lambda(\theta(n)).$$

Exercise 4.9. The fact that rem$(n, 3)$ is involved, should make it clear of what $p + 2$ or $p + 4$ will be divisible by.

Exercise 4.11.

(*c*) Display, say, the first 30 elements of the sequence, and then compute r_{30}. Then compute it again with Maple, without displaying it.

Exercise 4.15.

(*b*) The function `seq` must appear in the definition of `row`.

Exercise 4.18. The example 4.15 at page 84 is relevant here.

Exercise 4.19.

(a) How do you represent an even (odd, respectively) integer?

(b) For the second part of this exercise, we must repeatedly construct a new element of the sequence, and then verify if it does lie within the specified bound.

(c) This sequence is eventually periodic, rather than periodic (section 4.4). Therefore, when computing r_{1000}, you must ignore the initial transient.

Exercise 4.20.

(d) Test the function `fp`, by comparing it with the Maple function `frac`.