

# Classical Algebra (Math 326) Written Assignment

due March 3, 2000

Do one of A or B.

A. Do the following:

1. Write a computer function, taking “numerator”  $m$ , “denominator”  $n$ , “base”  $b$ , and “precision”  $r$  as arguments, that writes out the successive  $b$ -adic digits in the expansion of the *proper* fraction  $m/n$ . Be careful that your program never attempts the division algorithm with divisor 0. If it helps, assume that  $m$  and  $n$  are coprime and that  $n$  does not divide any power of  $b$ .

Assuming that the fraction is proper, i.e.,  $0 < m < n$ , the digits  $c_1, c_2, \dots$  in the  $b$ -adic expansion of the fraction are characterized by the relation

$$\frac{m}{n} = \sum_{j=1}^{\infty} c_j \left(\frac{1}{b}\right)^j \quad \text{with } 0 \leq c_j \leq b-1 \quad .$$

For the purpose of this exercise computing the expansion with precision  $r$  means finding the first  $r$  of the  $b$ -adic digits, i.e.,  $c_1, c_2, \dots, c_r$ .

2. Use your program to find a pattern in the digits of the 400-adic expansion (i.e.,  $b = 400$ ) of the fraction

$$\frac{3}{40487} \quad .$$

3. Make the source code for the program available in your on-campus web site along with a file containing the output from your program for the previous item with precision  $r = 100$ .

The web write-up should (1) include an explanation of how your program works and (2) present your solution for the problem of finding the digit pattern.

The URL for the web page should be of the form

<http://www.albany.edu/~login-id/math326/assgt2.html>

unless you present a reasonable excuse for submission in some other form.

Keep the URL in force through the last day of examinations this semester.

4. Submit a printout of your web page. Be sure to write your name and the URL for your webpage on the printout.

**OR**

B. Do the following:

Read section A of chapter 10.

Problems 1 – 4: Submit formally written solutions with explanations for the following problems in the text by Childs:

**10 A:** 1, 2, 3, & 4.

Problem 5: Find the 400-adic expansion of the fraction

$$\frac{3}{40487}$$

with precision 15. (The term precision is explained in the directions above for option A of this assignment.)

Document network location:

DVI: <http://math.albany.edu:8000/math/pers/hammond/course/mat326s2000/assgt/c1a000225.dvi>

HTML: <http://math.albany.edu:8000/math/pers/hammond/course/mat326s2000/assgt/c1a000225.html>