Homework 3: Algol 60

This homework is due Monday February 13, 1989 at the beginning of the lecture (1:10 PM). Each weekday that the homework is late you lose 10% of the possible points.

1. (3 points) Draw a contour diagram for the procedure whose outline is shown in Figure 3.5 on Page 110 in the text.

2. (5 points) Do exercise 3-9 on page 118 in the text.

3. (10 points.) Write an Algol 60 procedure, `prodsums` such that

   $$\texttt{prodsums}(a, m, n, f) \quad = \quad \prod_{i=1}^{m} \sum_{j=1}^{n} f(a[i,j]),$$

   where a is an $m \times n$ array of **real**s, m and n are integers (greater than one), and f is a procedure that takes a single **real** argument and returns a **real** result. That is, a call of `prodsums(a,m,n,f)` should return the product of $\sum_{j=1}^{\mathtt{n}} \mathtt{f}(\mathtt{a}[i,j])$, for each i from 1 to the value of `m`. For a fixed i, the expression $\sum_{j=1}^{\mathtt{n}} \mathtt{f}(\mathtt{a}[i,j])$, is the sum of the values of $\mathtt{f}(\mathtt{a}[i,j])$ for each j from 1 to the value of `n`, where $\mathtt{a}[i,j]$ is the $(i,j)^{\text{th}}$ element of the array `a`. (Hint: you may wish to use Jensen's device.)

   Minor syntax errors will not be counted against you, since we do not have an Algol 60 compiler.

4. (4 points) Do exercise 10 on page 151 in the text.

5. This exercise concerns the **switch** declarations of Algol 60 (see pages 149–150 in the text).

   (a) (2 points) Would it be a good idea to restrict the **switch** declaration so that only declarations of the form

   switch name = label1, label2, label3, ...;

   are permitted? (That is, would it be a good idea to rule out expressions in **switch** declarations?)

   (b) (8 points) Justify your answer on the basis of language design principles, and the efficiency of an implementation.