1997 Paper 1 Question 1

Foundations of Computer Science

This question has been translated from Standard ML to OCaml

The variant type `pri` defined below is to be used for the representation of priority queues which are finite or infinite ordered sets of integers.

```
type pri = E
         | N of int * (unit -> pri)
```

Define an OCaml function `intfromto i j : int -> int -> pri` which will return a representation of the ordered set of integers

```
{ i, i + 1, ..., j }
```

Define the function `first p : pri -> int` that will return the first (and hence smallest) integer in the given queue `p`, and `rest p : pri -> pri` that will return (if possible) a representation of the given queue `p` with its smallest element removed. Your implementation should be such that the expression

```
first (rest (intsfromto 20 1000000))
```

should evaluate efficiently.

Define an OCaml function `ins i p : int -> pri -> pri` which will return a priority queue with the integer `i` inserted in the proper position of the given queue `p`.

[10 marks]