1997 Paper 1 Question 1

Foundations of Computer Science

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

```
datatype PRI = E
             | N of int*(unit->PRI);
```

Define an ML 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 ML 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]