2001 Paper 1 Question 1

Foundations of Computer Science

This question has been translated from Standard ML to OCaml

(*a*) An OCaml program makes the following declarations:

```
let x = ref 0

let f n = (x := !x + 1; n + !x)

let g n =
  let x = ref 0 in
  x := !x + 1; n + !x
```

Consider evaluating each of the following expressions:

```
let l1 = List.map f [1; 2; 3; 4]
let l2 = List.map g [1; 2; 3; 4]
let l3 = List.map ref [5; 5; 5]
```

What value is returned in each case and how are the references affected? [5 marks]

(*b*) Code the function `filter` such that `filter p xs` returns the list of those elements of the list `xs` satisfying the predicate `p`. [1 mark]

(*c*) Use `filter` to express Quicksort. [4 marks]