# 2004 Paper 1 Question 1

**Foundations of Computer Science**

(a) What does the ML function `map` do? Give an example, first coded without `map` and then with it, to illustrate how it can lead to more compact or comprehensible code. [3 marks]

(b) Functions `foldl` and `foldr` might be defined as

```
fun foldl f (e, []) = e
  | foldl f (e, x::xs) = foldl f  (f(e,x), xs);

fun foldr f ([], e) = e
  | foldr f (x::xs , e) = f(x, foldr f (xs,e));
```

Explain what these two functions do and why they may be useful. [4 marks]

(c) Here is a typical use of `map`:

```
fun mangle n = (n-2)*(n+7);
fun manglelist x = map mangle x;
```

Show how to express `manglelist` using one of the "fold" functions rather than `map`. [3 marks]