1993 Paper 1 Question 7

State carefully what it means to say that a function has time complexity $O(f(n))$, and give ML definitions for some example `int ->int` functions which have time complexities $O(\log n)$, $O(n)$, $O(n^2)$, $O(n^3)$. In what circumstances can a function have time complexity $O(1)$?

Estimate the time complexities of the functions `f1`, `f2` and `f3` defined below:

```
fun f1  0  =  1
  |  f1  n  =  1 + f1(n-1);

fun f2  0  =  1
  |  f2  n  =  f2(n-1) + f1 n;

fun f3  0  =  1
  |  f3  n  =  f3(n div 7) + f3(5*n div 7) + f1 n;
```