

Program Optimisation

Winter Semester 2004

8. Homework

Deadline: 11 Jan 2005 12:00

Exercise 1:

4 Points

Carry out register-allocation for the optimised version of the function `swap` from the beginning of the lecture. How many registers are necessary?

Exercise 2:

10 Points

Consider the program:

```
f1 (n,x,y) {
    if (n <= 1) return y;
    n = n-1;
    z = x+y;
    z = f1 (n,y,z);
    return z;
}
f (n) {
    z = f1 (n,1,1);
    return z;
}
main () {
    n = read ();
    y = f (n);
    write (y);
}
```

Eliminate the recursion in the function `f1` and carry out inlining.

Exercise 3:

6 Points

Let $G = (V, E)$ be an undirected graph and $\gamma(G)$ the minimum number $|c(V)|$ for coloring c of G . Show that:

- If G has no loop then $\gamma(G) \leq 2$.
- If each node has degree at most 2, then $\gamma(G) \leq 3$.
- If G has a k -clique, then $k \leq \gamma(G)$.