

Program Optimisation

Winter Semester 2004

7. Homework

Deadline: 21 Dec 2004 12:00

Exercise 1:

6 Points

Show that the k -th difference of a polynomial of degree $k > 0$ is a constant. For a polynomial p , the k -th difference is defined as:

$$\Delta_0(x) = p(x)$$

$$\Delta_k(x) = \Delta_{k-1}(x) - \Delta_{k-1}(x - 1)$$

Exercise 2:

14 Points

Consider the following program fragment:

```
B = b;
for (i=0; i<n; i++) {
    A = a + i*h;
    for (j=0; j<h; j++) {
        A1 = A + j;
        B1 = B + j;
        T = M[A1];
        M[B1] = T;
    }
    B = b + i*h;
}
```

Apply the ROS-optimization on this program. I.e.

- determine the loops;
- rotate the loops;
- determine the iteration variables;
- determine the loop invariants;
- finally apply the transformation!