

**Homework part C.**

**5 points [3p: C1] + [2p: C2]**

**C1.** (3 points) Implement the algorithm from Lecture 9 for finding the median.

**C2.** (2 points) Consider  $f(X), g(X)$  and  $h(X)$  three polynomials of degrees  $n, n$  and  $2n$ , respectively. The following randomized algorithm tests the polynomial equality ( $f \cdot g = h$ ):

```
choose uniformly  $p \in \{1, 2, \dots, 3n\}$ ;  
if ( $f(p) \cdot g(p) = h(p)$ ) then  
  return true;  
else  
  return false;  
end if
```

Implement first this randomized algorithm and then use amplification approach to decrease the error probability under  $10^{-5}$  (we know that the algorithm errs with probability at most  $2/3$ ).

*Hint.* A polynomial of degree  $k$  can be represented by an array of length  $k + 1$  containing its coefficients.

Probabilities & Statistics