# Homework 3 in Cryptography II

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**Exercise 7.**
Let $p > 2$ be prime and let $\left(\frac{a}{p}\right)$ be the Legendre-symbol. Prove the following:

(a) $\left(\frac{-1}{p}\right) = (-1)^{\frac{p-1}{2}}$,

(b) $\left(\frac{a}{p}\right)\left(\frac{b}{p}\right) = \left(\frac{ab}{p}\right)$,

(c) $\left(\frac{a}{p}\right) = \left(\frac{b}{p}\right)$, if $a \equiv b \mod p$.

**Exercise 8.**
Prove that Algorithm 8 from the lecture notes computes the Jacobi symbol $\left(\frac{a}{n}\right)$.

**Hint:** Use the law of quadratic reciprocity, which states that

$$\left(\frac{a}{n}\right)\left(\frac{n}{a}\right) = (-1)^{\frac{a-1}{2}\frac{n-1}{2}}.$$