Homework 2

1. Give regular expressions for (a) decimal numbers and for (b) binary numbers. (Hint: Observe that the empty string is not a number. Also observe that leading 0s are normally not written.)

2. Decide whether the following two regular expressions are equivalent $(\epsilon + a)^* \equiv^? a^*$ and $(a \cdot b)^* \cdot a \equiv^? a \cdot (b \cdot a)^*$.

3. Given the regular expression $r = (a \cdot b + b)^*$. Compute what the derivative of r is with respect to a and b. Is r nullable?

4. What is a regular language?

5. Prove that for all regular expressions r we have

$$\text{nullable}(r) \quad \text{if and only if} \quad \text{""} \in L(r)$$