Name: ______________________

Pid: ______________________

1. (10 points) Show that the set $\{0, 1\} \times [n]$ has cardinality $2n$.

2. (10 points) Let us consider group theory, it is a theory with undefined terms: group-element and times (if a and b are group elements, we denote a times b by $a \cdot b$), and axioms:

   1. $(a \cdot b) \cdot c = a \cdot (b \cdot c)$ for every group-elements a, b, and c;
   2. there is a unique group-element e such that $e \cdot a = a = a \cdot e$ for every group-element a (we say that such an element is the identity element);
   3. for every group-element a there is a group-element b such that $a \cdot b = e$, where e is the identoty element;
   4. for every group-element a there is a group-element b such that $b \cdot a = e$, where e is the identoty element.

   Let e be the identoty element. Show the following statements

   - if $b_0 \cdot a = b_1 \cdot a = e$, then $b_0 = b_1$, for every group-elements a, b_0, and b_1.
   - if $a \cdot b_0 = a \cdot b_1 = e$, then $b_0 = b_1$, for every group-elements a, b_0, and b_1.
   - if $a \cdot b_0 = b_1 \cdot a = e$, then $b_0 = b_1$, for every group-elements a, b_0, and b_1.