HOMEWORK

(1) Write out all elements of the set $\mathcal{P}(\{0,1,2\})$.
(2) Prove the following identity:

$$(X \cup Y) \cap Z = (X \cap Z) \cup (Y \cap Z)$$

(3) Prove the following identity:

$$(X \cup Y)^c = X^c \cap Y^c$$

(4) A set is called *finite* if it only has a finite number of elements. For a finite set X, we denote by $|X|$ the number of the elements in X. It is called the *order* of X. Establish the following theorem: if X is a finite set and $Y \subseteq X$ then

$$|Y| \leq |X|$$

Note that you should show that Y is also finite so be able to use $|Y|$.
THe converse of this result says that if $|Y| > |X|$ then $Y \nsubseteq X$.
(5) Decide (with proof) if the following are true always, sometimes, or never.
(a) Let X and Y be sets such that $X \setminus Y = \varnothing$. Then $X = Y$.
(b) Let X, Y, and Z be sets such that $X \setminus Y = Z$ and $Y \subseteq Z$. Then $X = Y \cup Z$.
(c) Let X be a set. Then $\{\varnothing\} \in \mathcal{P}(X)$.