(1) (10 points) Let $n$ denote the set

$$n = \{1, \ldots, n\}.$$ 

(a) Prove (for example by induction) that the power set $\mathcal{P}(n)$ of $n$ has $2^n$ elements.

(b) Now prove the following formula:

$$2^n = \sum_{k=0}^{n} \binom{n}{k}$$

(2) (20 points) Read Chapter 5 of the book. Then do questions 5.50, 5.10, 5.13 and 5.23 from the book.