HW #1

1. Prove that  $\sqrt{3}$  is irrational.

Bonus (not required): prove that for all primes  $p \ge 2$ ,  $\sqrt{p}$  is irrational (among other things, this shows us that there exist an infinite number of irrational numbers, due to the infinitude of primes)

2. Recall that the power set of a set A is the set of all subsets (not necessarily proper) of A.

Prove using induction, that for any finite set A with |A| = n,  $|P(A)| = 2^n \forall n \ge 1$ , where P(A) denotes the power set of A.

First:

Son care: 
$$N=0$$

A-[i],  $P(A)=[0i] \Rightarrow 2^{\circ}=1$ 

Ind Step: prove  $P(K) \Rightarrow P(K^{H})$ 

Assure  $P(K) = 2^{K}$  where  $K \in N$ 

$$P(K) + 2^{K} = 2^{K} \cdot 12^{K}$$

$$= 2 \cdot 2^{K}$$

$$= 2 \cdot 2^{K}$$

$$= 2 \cdot 2^{K}$$