LECTURE - 2

GROUP

SEMIGROUP

RING

FIELD

FIBONACCI NUMBER

THE **FIBONACCI NUMBERS** ARE THE NUMBERS IN THE FOLLOWING INTEGER SEQUENCE:

$$1,1,2,3,5,8,13,21,34,\ldots$$

BY DEFINITION, THE FIRST TWO FIBONACCI NUMBERS ARE 0 AND 1, AND EACH SUBSEQUENT NUMBER IS THE SUM OF THE PREVIOUS TWO.

WELL ORDERING PROPERTY

LET S BE A SET OF INTEGERS. AN INTEGER m IS CALLED A *LEAST ELEMENT* OF S IF m IS AN ELEMENT OF S, AND FOR EVERY x IN S, $m \leq x$.

TRICHOTOMY LAW

$\forall\, a, either, a > 0, a = 0$ or $a < 0.$

ARCHIMEDEAN PROPERTY

IF a AND b ARE ANY POSITIVE INTEGERS, THEN THERE EXISTS A POSITIVE INTEGER N SUCH THAT $na \geq b$.

FIRST PRINCIPLE OF FINITE INDUCTION

LET S BE A SET OF POSITIVE INTEGERS WITH THE FOLLOWING PROPERTIES:

1. **THE INTEGER 1 BELONG TO S**
2. **WHENEVER THE INTEGER K IS IN S, THE NEXT INTEGER K+1 MUST ALSO BE IN S**

THEN S IS THE SET OF ALL POSITIVE INTEGERS

THE PRINCIPLE OF FINITE INDUCTION PROVIDES A BASIS FOR A METHOD OF PROOF CALLED MATHEMATICAL INDUCTION

THE BINOMIAL THEOREM

$$(a+b)^n = \binom{n}{0}a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \dots + \binom{n}{n-1}a\,b^{n-1} + \binom{n}{n}b^n$$

$$= \sum_{k=0}^{n} \binom{n}{k} a^{n-k} b^k$$

WHERE,

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$