

# MAT426: Advanced Calculus

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# Finite, Countable and Uncountable Sets

## Definition

For any positive integer  $n$ , let  $J_n$  be the set whose elements are the integers  $1, 2, \dots, n$ . Let  $J$  be the set consisting of all positive integers. For any set  $A$  we say,

1.  $A$  is finite  $A \sim J_n$  for some  $n$ . (the empty set is also considered to be finite)
2.  $A$  is infinite if  $A$  is not finite.
3.  $A$  is countable if  $A \sim J$ .
4.  $A$  is uncountable if  $A$  is neither finite nor countable.
5.  $A$  is atmost countable if  $A$  is either finite or countable.

A set  $A$  is said to be **finite** if it is empty or if there is a one-to-one correspondence between  $A$  and  $J_n$  for some positive integer  $n$ . A set that is not finite is said to be **infinite**.