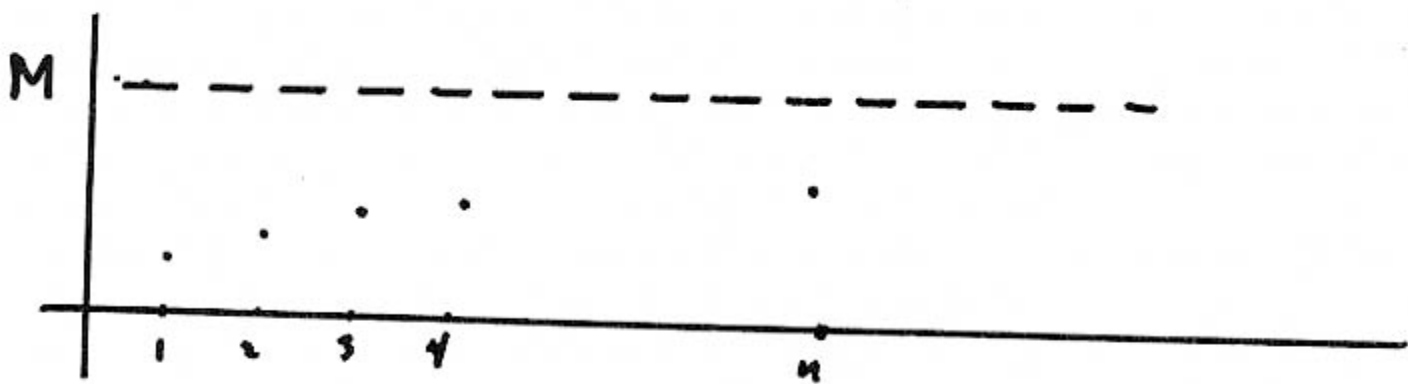


In some cases, we need to show that a sequence converges to a limit, even though we can't calculate the exact value of the limit.

### Monotonic Convergence Theorem

If  $\{a_n\}$  is increasing ( $a_n \leq a_{n+1}$  for all  $n$ )  
and bounded from above ( $a_n \leq M$  for all  $n$ ),  
then  $\lim_{n \rightarrow \infty} a_n = A$  exists and  $A \leq M$ .



(If a sequence does not have a limit as  $n \rightarrow \infty$ , it is because either it goes to  $+\infty$  or  $-\infty$  or it oscillates.)