





Proof.







on first proof (by contradiction)



# our first proof (by construction)

## Theorem

For all integers  $n$ , if  $n$  is even, then  $n^2$  is even.



## Proof.

- Pick an arbitrary even integer  $n$ : we want to show that  $n^2$  is even
- Since  $n$  is even, there is some integer such that  $n = 2k$
- This means that  $n^2 = (2k)^2 = 4k^2 = 2(2k^2)$
- From this we see that there is an integer  $m$  (namely  $2k^2$ ) where  $n^2 = 2m$
- Therefore  $n^2$  is even, which is what we wanted to show. ■