

COMP302 A2Q5

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[Question 5: 10 points] Prove by induction that the insertion sort program shown in class works correctly. You can assume that the insert program works correctly but you need to write carefully what it means for this program to be correct before you proceed with your main proof.

```
let rec insert n lst =  
  match lst with  
  | [] -> [n]  
  | x :: xs -> if (n < x) then n:: lst else x::(insert n xs)
```

if the list is empty then n is inserted into it, this works for $n=1$ or any other number.
(base case)

when $n=k$,
if the list is from x to xs, if k is smaller than 1 then it is added into the list, otherwise x is added into the recursion sub problem of insert starting from k. This inductive step works and it will continue to work for $n=k+1$.
(inductive step)

therefore the insert function works correctly.