

Assignment 11

Exercise 1

To start the induction, we need a solid basecase. I am only going to use one basecase in this proof, as the definition of factorial to 1 is 1, also written as:

$$1! = 1$$

We can thereby verify that it is correct, and we can use it in our proof. We can now move on and look at the inductive step. If we look at our program, we see that the inductive step occurs when a number k is larger than 1. That gives us:

$$fact(k) = k \cdot fact(k - 1)$$

To move on we must assume that this is what the program does as if we assume it is incorrect, we really cant say anything about $fact(n)$. If our assumption made just before, then $fact(k)$ is correct. It is also important to note that we make k one smaller so we can't miss our basecase, and it is reduced as well. This means we need to prove a case smaller than the case with k . We can now create an inductive proof. As we know from the basecase:

$$fact(1) = true$$

And if that in this case is true (which we proved earlier it was) then:

$$fact(2) = true$$

And if this is true, then

$$fact(3) = true$$

This way we can keep going till, if

$$fact(k - 1) = true$$

Then that means

$$fact(k) = true$$