Exercise 1)

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(1) Write down a proof that the following recursive factorial function is correct using *proof by induction*. Put your inductive proof into a pdf file (`text_answers.pdf`). *Hint:* review the lecture slides for the two components of a proof by induction, i.e. (a) the base case and (b) the inductive step.

```
/* Factorial function definition */
int fact(int n)
{
  /* pre-condition */
  assert (n >= 1);

  /* post-condition */
  if(n > 1)
    return n * fact(n - 1);
  else
    return 1;
}
```

First we prove that the function is correct for a given base case. The integer range in the factorial function is n≥1. Let's use fact(1) which equals 1 and is what the function will return when n=1.

Next is the inductive step. We consider the recursive case with the integer input k>1. Fact(k)=k*fact(k-1). We assume this is correct (inductive hypothesis). The k'th factorial is then fact(k)=k*fact(k-1).

Let's say k=3. The function computes 3*2*1=6 which correlates to the above function. Since fact(3) is proved to be correct then fact(2) and fact(1) are proven as well. So is fact(4), fact(5) and so on.