6CCS3COM Computational Models

Tutorial 1

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1. Give examples of total and partial functions on natural numbers.
2. To test whether a number is even or odd, a student has designed the following function:

```
test(x) :
    if x = 0 then ‘‘even’’
    else if x = 1 then "odd" else test(x-2)
```

   Is this a total function on the set of integer numbers? Is it total on the natural numbers?

3. Consider the following variant of the Halting problem:

   "Write an algorithm `H'` such that, given the description of an algorithm `A` that requires one input, `H'` will return `1` if `A` stops for any input `I` and `H'` will return `0` if there is at least one input `I` for which`A` does not stop."

   In other words, the algorithm `H'` should read the description of `A` and decide whether it stops for all its possible inputs or there is at least one input for which `A` does not stop.

   Give the intuition of a proof that shows that this version of the Halting problem is also undecidable.