Functions

Analogous to the functions you learn about in math class, e.g.

$$f : \mathbb{R} \longrightarrow \mathbb{R} \; ; \qquad ①$$

$$f(x) = x^2 + x \; ; \qquad ②$$

① "meta" information: name, domain + range.

② Compact description of how to compute the function.

Now in C++:

① double f (double x);

f(_) is of type double

② {return (x*x + x); }

All together:

```
double f(double x) {
    - - -
    - - -
    - - -
    return x*x +x;
}
```

Aside: how many functions are there from a finite set A to another finite set B?

i.e., $\left| \{ f : A \rightarrow B \} \right| = ?$

$f(a_1) = b_1$
$f(a_2) = b_2$
$\vdots$

$|A|$ choices, $|B|$ options for each choice.

So, there are $|B|^{|A|}$ such functions.

So, how many bits are required to write such a function? $\log_2 |B|^{|A|} \geq |A|$

So if $A =$ strings of length 32, this is huge! (2^{256} bits to store).

We are concerned with understanding which functions have "nice" representations.