

## Injective/Surjective 1

Let  $X$  and  $Y$  be sets and  $f: X \rightarrow Y$  a function.

To say  $f$  is injective means if  $x_1$  and  $x_2$  are elements of  $X$  with  $f(x_1) = f(x_2)$  then  $x_1 = x_2$ .

Equivalently: If  $x_1 \neq x_2$  then  $f(x_1) \neq f(x_2)$ .

To say  $f$  is surjective means if  $y \in Y$  then there is  $x \in X$  such that  $f(x) = y$ .

Equivalently: The range of  $f$  equals  $Y$ .

Terminology: If  $A$  is a subset of  $X$  then  $f(A)$  is the subset of  $Y$  defined by

$$f(A) = \{f(x) \mid x \in A\} = \{y \in Y \mid y = f(x) \text{ for some } x \in A\}.$$

And

$$\text{range}(f) = f(X)$$