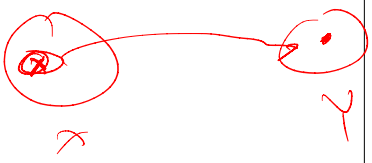
MATH 147 Review: Surjectivity and Injectivity

Facts to Know

Surjective

$f: X \to Y$

- For each $y \in Y$, there exists $x \in X$ such that $f(x) = y$
- $\text{ran}(f) = Y$



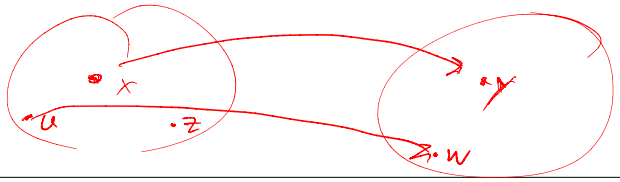
Injective

$f: X \to Y$

- For all $x_1, x_2 \in X$, if $f(x_1) = f(x_2)$ then $x_1 = x_2$
- No point in the range is mapped to more than once.

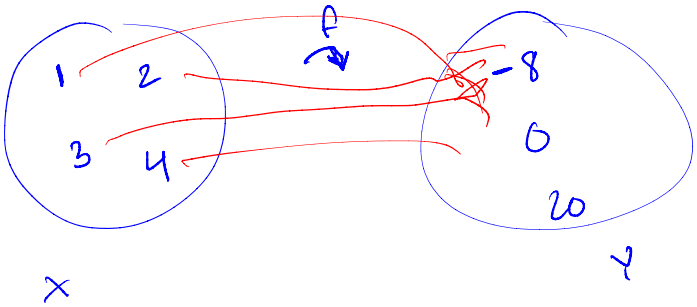
Bijective

= surjective and injective



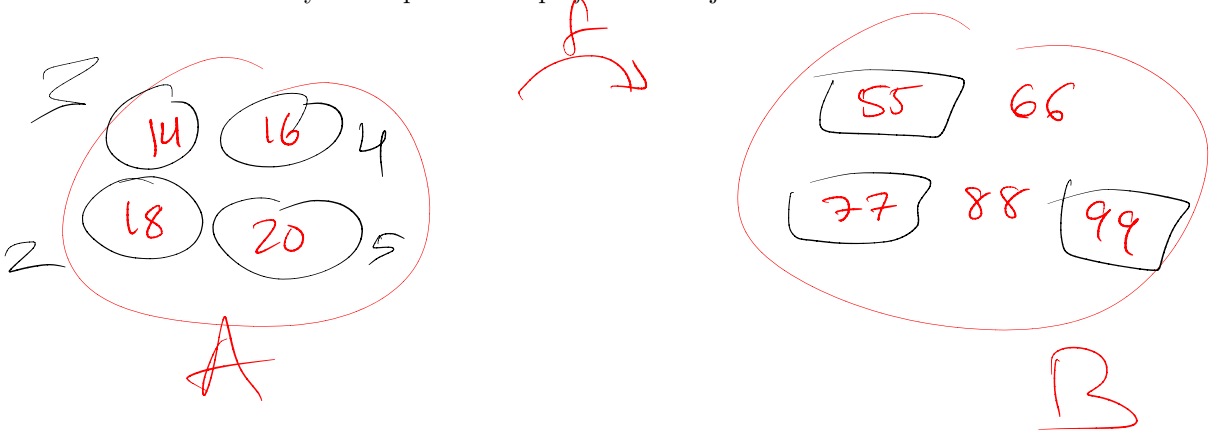
Examples

1. Consider two sets $X = \{1, 2, 3, 4\}$ and $Y = \{-8, 0, 20\}$. Let f be a surjective function from X to Y such that for any two elements x_1 and x_2 of X, if $x_1 < x_2$, then $f(x_1) \leq f(x_2)$. What is the minimum possible value of $f(4)$?



$f(4) = 20$

2. A function f maps the elements of $A = \{14, 16, 18, 20\}$ to elements of $B = \{55, 66, 77, 88, 99\}$. How many of the possible maps f are not injective?



5^4 = # functions

not injective = # functions − # injective

5^4 − 120 = final answer