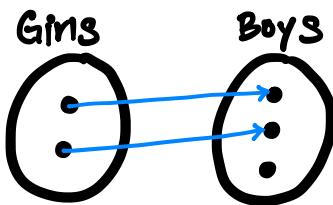


* Note that the analogy is $f: \text{Girls} \rightarrow \text{Boys}$,
so in order to be a valid function,
every girl must be in a relationship

This is the PG-rated version of that analogy cause I'm everyone likes those words too shy to write down. -S

Injective: $\forall a, b \in X, f(a) = f(b) \Rightarrow a = b$

"one-to-one"

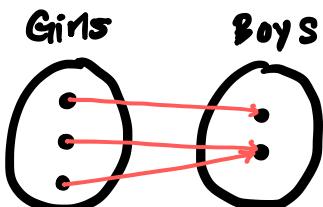


Every relationship is monogamous,
so some boys could be left single.

Surjective:

"onto"

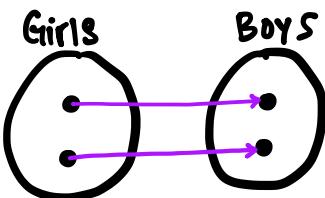
$$\forall y \in Y, \exists x \in X, f(x) = y$$



Every boy is in a relationship,
which means 1 boy could date multiple girls

brrh

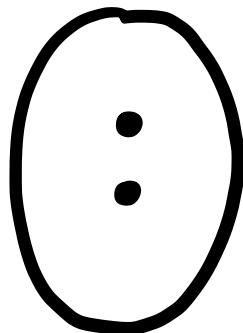
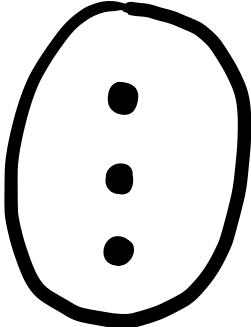
Bijection: both injective & surjective



Everyone in monogamous relationship

Exercise: How do the relative sizes of the domain and codomain affect whether or not you can create an injection or surjection?

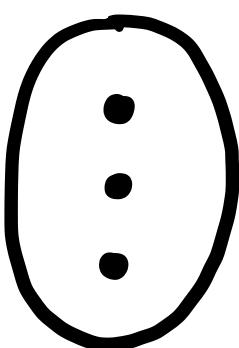
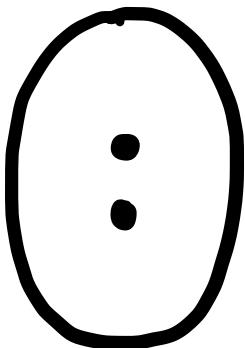
Girls > # Boys



plz

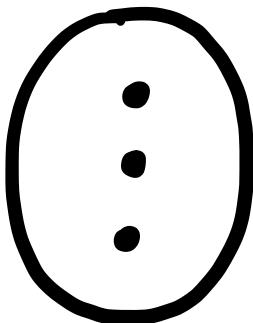
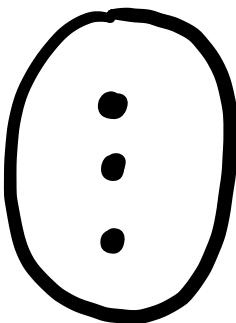
Print this out/
redraw this
and actually
try to draw some
functions yourself.
(no pressure—just
mess around with it)

Girls < # Boys



Then identify
whether it is an
injection or
surjection or
neither or
both!

Girls = # Boys



This is how you
can "gain" ✰
* intuition" ✰
for the definitions!

⚠️ Critical: You should be able to

- ① have an instant picture in your head when you see the words "injective" and "surjective" (don't mix 'em up!)

To practice — try filling out the chart below

- ② apply the formal definitions so you can actually prove injectivity & surjectivity

To practice — READ CLIVES! (his notes are the best!)

Injective	Surjective	Function Diagram	
✓	✗	○	○
✗	✓	○	○
✓	✓	○	○
✗	✗	○	○

If you're struggling on this... good! It is so important you continue to attempt this exercise without flipping to the answers. Even if you get it wrong, reflecting on where you struggled will help you find your weak points and help the right answers STICK!



You definitely
tried this on your own
before turning the page,
right?

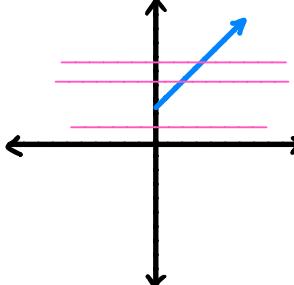
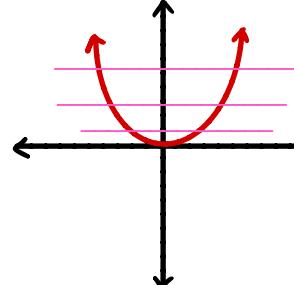
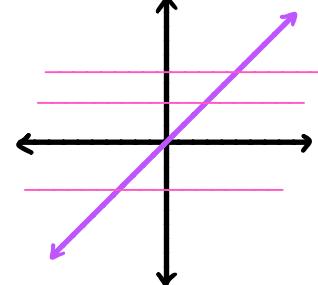
Please say yes

Injective	Surjective	(Example) Diagram
✓	✗	
Bijective	Surjective	Diagram
✓	✓	
✗	✗	

Some more intuition help: "Horizontal Line Test"

⚠ NOTE: You'll never be allowed to use graphical tests for a proof

(they are just for helping your intuition/mental picture)

Injection	Surjection	Bijection
<p>*** Note the domain and codomain sets!!! ***</p> <p>Every horizontal line crosses the graph</p> <p>$f: \mathbb{R}^{\geq 0} \rightarrow \mathbb{R}^{\geq 0}$ $f(x) = x + 1$</p>  <p>at most one time</p>	<p>$f: \mathbb{R} \rightarrow \mathbb{R}^{\geq 0}$ $f(x) = x^2$</p>  <p>at least one time (note the codomain)</p>	<p>$f: \mathbb{R} \rightarrow \mathbb{R}$ $f(x) = x$</p>  <p>exactly one time</p>

⚠ MOST IMPORTANT TAKEAWAY

This PDF gave you a bunch of little exercises to build your intuition. And it presented the same definitions from multiple perspectives.

→ jobs, future courses, even this course like a month ago
But in real life, no one is going to hand you a worksheet to help you.

∴ So how would you help yourself? ∴

Think about how you could get into the habit of engaging actively with Clive's ← your text — so that you could have made these to help yourself

:*.* You can do it! *.*