Topics for today or soon:

Section 4 of handout:

- Countable Sets, Uncountable Sets
- Cantor’s Thm

Sections 5 and 6

- Russell’s Paradox and Set Theory Subtleties
- Related Paradoxes and Theorems
BREAKOUT ROOM PROBLEMS

(1) Show that $\mathbb{N} \times \mathbb{N}$ is countable.

(2) Show that $\mathbb{Z} \times \mathbb{Z}$ is countable.

(3) Let $f : [4] \rightarrow \text{Power}([4])$ (where $[4] = \{1,2,3,4\}$) be given by:

- $f(1) = \emptyset$
- $f(2) = \{1,2\}$
- $f(3) = \{2,4\}$
- $f(4) = [4]$

Describe $T = \{ s \in [4] \mid s \notin f(s) \}$.

Convince yourself that $T$ is not in the image of $f$. [This is not a precise task.]
4) Is \( \text{Power}(\{a,b\}^*) \cup \mathbb{N} \) countable?

5) Find an example of an injective and/or surjective and/or bijective map to help you remember these terms.

[This is not a precise question.]