- Set Theory   Subtleties

  Not subtle : If T is uncountable, and
  there is a surjection $S \to T$, then S
  is uncountable.

  Subtle : If there is an injection $S \to T$,
  then there is a surjection $T \to S$.

- Russell's Paradox

- Related Paradoxes   (Section 6 of handout)

- Start Finite Automata ($\S 1.1$ of Textbook)

BREAKOUT ROOM PROBLEMS

① If S is countable, and there is

a surjection $S \to T$, then T is

countable. (Prove this)

② Is $\text{POWER}\left(\{a,b\}^*\right) \cup \mathbb{N}$ countable?

③ Is there a bijection

$$[2]^{\mathbb{N}} \to [3]^{\mathbb{N}},$$

and can you describe one?

(4) Let F be the set of functions $\mathbb{N} \to \mathbb{N}$ that can be desribed in English (assuming a fixed, precise interpretation of English). Is F countable or uncountable ?

(5) Let $\mathbb{N}^{\mathbb{N}}$ be the set of functions $\mathbb{N} \to \mathbb{N}$. Is $\mathbb{N}^{\mathbb{N}}$ countable or uncountable ?