1 Intro

- My OH is Monday 1-2 and Tuesday 3-4 in Cory 212.
- Email is first.last@
- 3rd year cs + math major
- hobbies?

1.1 Some CS70 advice

- Goal: enhance problem solving techniques/approach
- Don't fall behind on content, catching up will not be fun
- problems, problems, more problems
- Ask lots of questions (imperative for strong foundation)
- Don't stress, we're in this ride together

2 Propositional Logic

Relevant notation:

- $\land$ = and
- $\lor$ = or
- $\neg$ = not
- $\implies$ = implies
- $\exists$ = there exists
- $\forall$ = forall
- $\mathbb{N}$ = natural numbers $\{0, 1, \ldots\}$
- $a|b$ = a divides b

$P \implies Q$ is an example of an implication. We can read this as "If P, then Q." An implication is false only when P is true and Q is false. If P is false, the implication is vacuously true.

Definition 2.1 (Contrapositive)
If $P \implies Q$ is an implication, then the implication $\neg Q \implies \neg P$ is known as the **contrapositve**.

An important identity is that $P \implies Q \equiv \neg Q \implies \neg P$.

3 Proofs

Induction will be in its own section.

Different methods.

3.1 Direct proof

Want to show $P \implies Q$ by assuming P and logically concluding Q.

3.2 Contraposition

Want to show $P \implies Q$ by equivalently proving $\neg Q \implies \neg P$.

3.3 Contradiction

Want to show P. We do this by assuming $\neg P$ and concluding $R \land \neg R$.

Why? Idea is that if we can show the implication $\neg P \implies (R \land \neg R)$ is True, this is the same as showing $\neg P \implies F$ is True. The contraposition gives $T \implies P$.

3.4 Cases

Break up a problem into multiple cases i.e. odd vs even.