CSCI-2200 FOCS F 2022 Crib Sheet Exam 1 Tuesday, October 5, 2022 Hayden Fuller Notes:
NEGATION: $a \vee b => \neg a \wedge \neg b$; $a \wedge b => \neg a \vee \neg b$; if a, then b=$a \to b => a \wedge \neg b$
$\forall x,\ A(x) => \exists x : \neg A(x)$; $\exists x : A(x) => \forall x \neg A(x)$
$\forall x : (\exists y : 2x - y = 0) = T$(already know x); $\exists y : (\forall x : 2x - y = 0) = F$(can't predict x);
$\exists y : (\forall x : xy = 0) = T$(x doesn't matter, y=0)
statement: $p \to q$ converse: $q \to p$ inverse: $\neg p \to \neg q$ contrapositive: $\neg q \to \neg p$
$\cup$ union; $\cap$ intersection; $\subset$ proper subset; $\subseteq$ subset(can be equal);

What type of proof is appropriate? Contradiction:
There is a prime number greater than ab
$2^{\frac{1}{p}}$ is irrational for any integer $p > 2$, given: $a, b, c, n \in \mathbb{N}$, $n > 2$, $a^n + b^n \neq c^n$
Contraposition:
Direct:
There is an even number grater than ab (either $ab + 1$ or $ab + 2$ is even)
if n and q are natural numbers, then there exists unique intergers d and r satisfying $n = dq+r$, with $d \in 0 \cup \mathbb{N}$ and $0 \leq r \leq q$.
Leaping induction:
Induction:
$(a + b)^n \geq a^n + b^n$, when n is a natural number.
$n^2 \leq 2^n$ for all $n \geq 4$
5 divides $11^n - 6$ for all $n \geq 5$; show 5 divides $11^5 - 6$ and show for $n \geq 5$, if 5 divides $11^n - 6$, then 5 divides $11^{n+1} - 6$
Weak induction:
$11^n - 6$ is divisible by 5 if n is a natural number.