

CS 512, Spring 2017, Handout 06

***Classical* Propositional Logic:
Proof Sketch of its Soundness**

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January 25, 2017

soundness once more

► **Theorem (Soundness):**

If $\varphi_1, \varphi_2, \dots, \varphi_n \vdash \psi$ then $\varphi_1, \varphi_2, \dots, \varphi_n \models \psi$.

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(sometimes called **strong induction**) on $k \geq 1$,
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Such a sequent implies $\varphi_1 = \psi$, i.e., $\psi \vdash \psi$.

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Induction hypothesis (IH): Soundness holds for every $k' < k$.

Structure of a formal proof with n premises:

| | | |
|----------|-------------|---------------|
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| 2 | φ_2 | premise |
| \vdots | \vdots | |
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This means line k uses lines k_1 and k_2 , with $k_1, k_2 < k$.
- ▶ Use IH on $\varphi_1, \varphi_2, \dots, \varphi_n \vdash \psi_{k_1}$ and $\varphi_1, \varphi_2, \dots, \varphi_n \vdash \psi_{k_2}$.

