Propositional Calculus I:
The Formal Language, Rules of Inference (initial), Application to Some Motivating Problems

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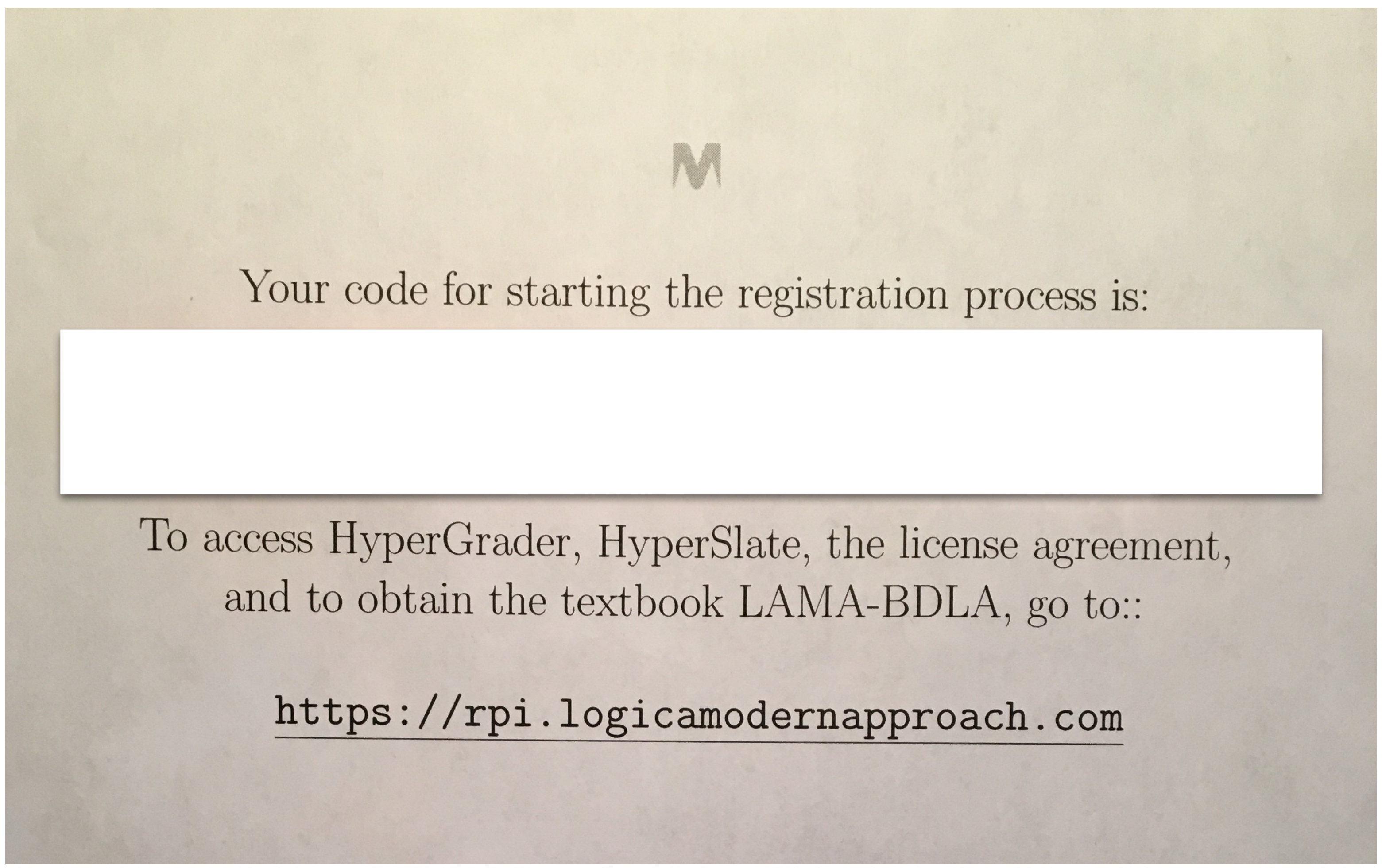
Intro to (Formal) Logic
1/28/2019

Re-re-re…orientation w.r.t. web pages …

The Starting Code Purchased in Bookstore Should By Now've Been Used to Register & Subsequently Sign In



Your code for starting the registration process is:

To access HyperGrader, HyperSlate, the license agreement, and to obtain the textbook LAMA-BDLA, go to::

https://rpi.logicamodernapproach.com

How'd We Arrive Here?

(Selmer's Leibnizian Whirlwind History of Logic)

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Intro to Logic
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Questions/comments/objections …?

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Micro-homily:

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skipping to ~ p. 34!

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M. Chi: Self-testers end up being self-made.

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M. Chi: Self-testers end up being self-made.

"What category of English sentences does logic focus on?"

The Formal Language

CHAPTER 2. PROPOSITIONAL CALCULUS

Syntax	Formula Type	Sample Representation
$\mathsf{P}, \mathsf{P}_1, \mathsf{P}_2, \mathsf{Q}, \mathsf{Q}_1, \ldots$	Atomic Formulas	"Larry is lucky." as L_l
$\neg\phi$	Negation	"Gary isn't lucky." as $\neg\mathsf{L}_g$
$\phi_1 \wedge \ldots \wedge \phi_n$	Conjunction	"Both Larry and Carl are lucky." as $\mathsf{L}_l \wedge \mathsf{L}_c$
$\phi_1 \vee \ldots \vee \phi_n$	Disjunction	"Either Billy is lucky or Alvin is." as $\mathsf{L}_b \vee \mathsf{L}_a$
$\phi \rightarrow \psi$	Conditional (Implication)	"If Ron is lucky, so is Frank." as $\mathsf{L}_r \rightarrow L_f$
$\phi \leftrightarrow \psi$	Biconditional (Coimplication)	"Tim is lucky if and only if Kim is." as $\mathsf{L}_t \longleftrightarrow L_k$

Table 2.1: Syntax of the Propositional Calculus. Note that ϕ, ψ, and ϕ_i stand for arbitrary formulas.

The Formal Language

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Exercise: Is this language Roger-decidable? Prove it!

“NYS 1” Revisited

Given the statements

$\neg a \vee \neg b$

b

$c \rightarrow a$

which one of the following statements must also be true?

c

$\neg b$

$\neg c$

h

a

none of the above

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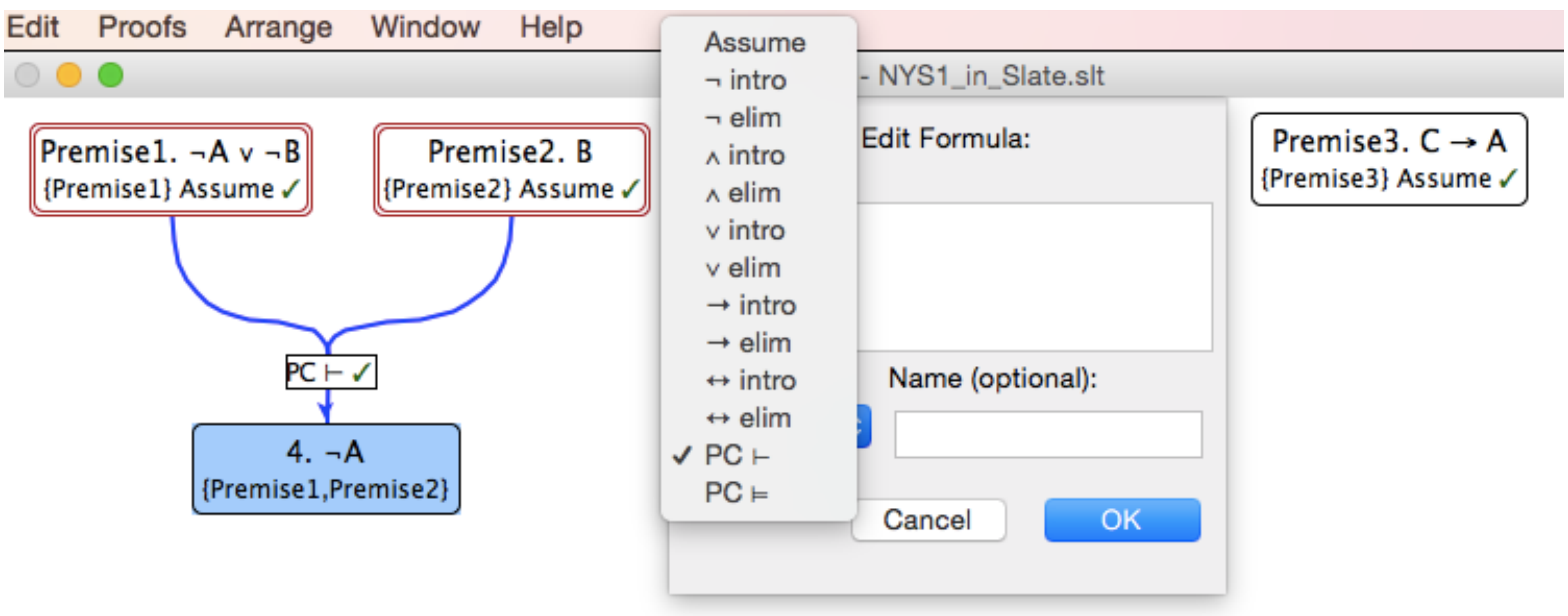
Our First Rule of Inference: PC (Entailment) Oracle



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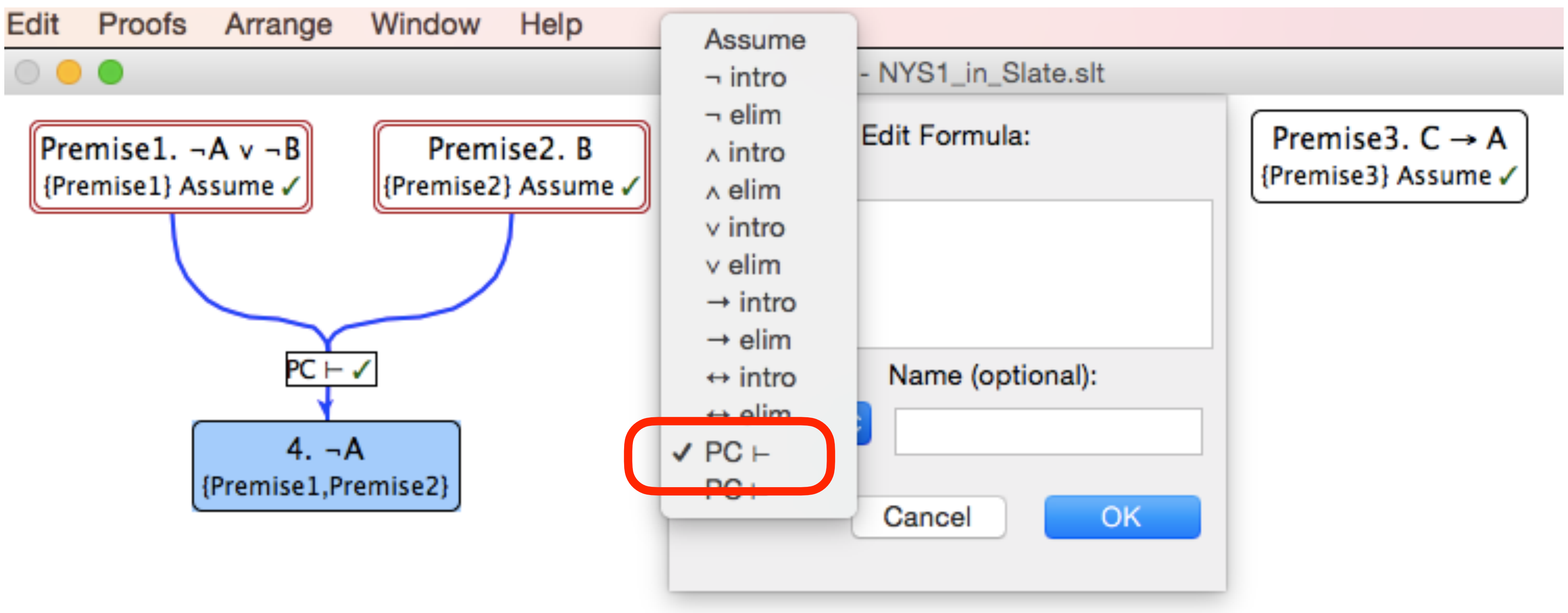

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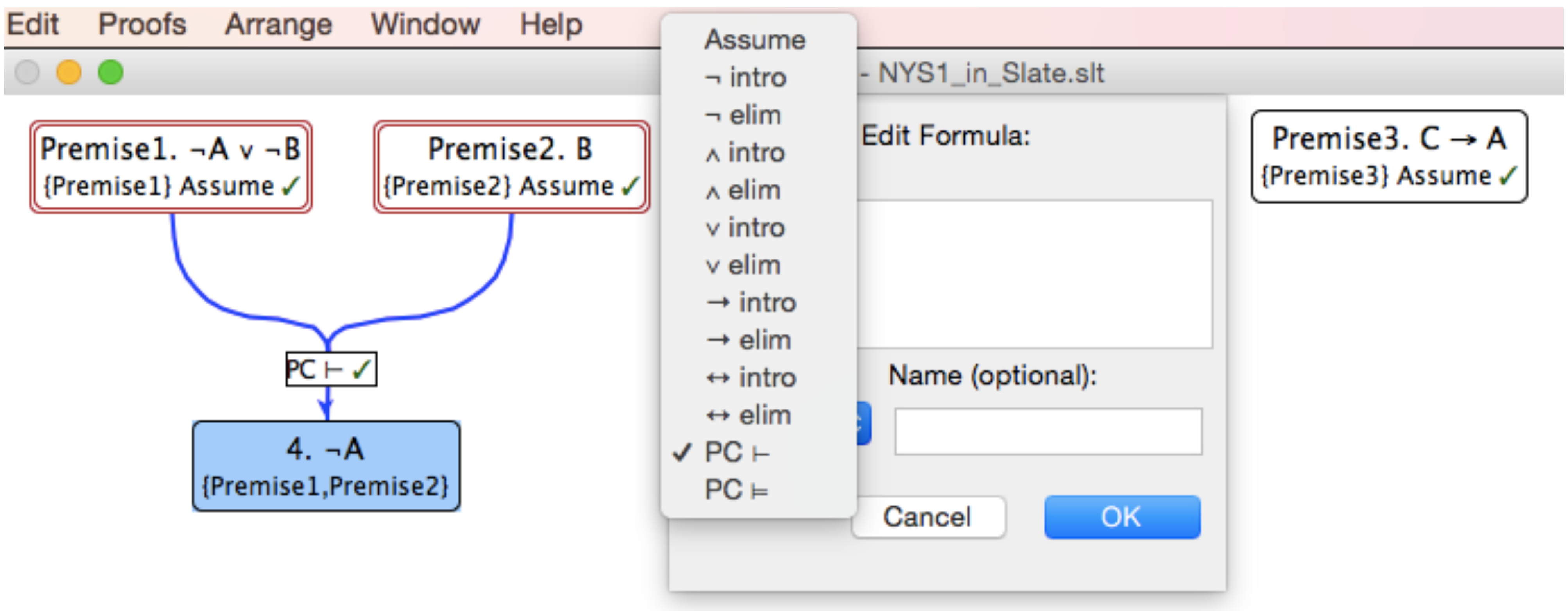

Our First Rule of Inference: PC (Entailment) Oracle

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“NYS 3” Revisited

Given the statements

$\neg\neg c$

$c \rightarrow a$

$\neg a \vee b$

$b \rightarrow d$

$\neg(d \vee e)$

which one of the following statements must also be true?

$\neg c$

e

h

$\neg a$

all of the above

“NYS 3” Revisited

Given the statements

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“NYS 3” Revisited

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$c \rightarrow a$

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$b \rightarrow d$

$\neg(d \vee e)$

Show in HyperSlate that each of the first four options can be proved using the PC entailment oracle.

which one of the following statements must also be true?

$\neg c$

e

h

$\neg a$

all of the above