Derived Rules
David Sanson — 112 — 18 Feb 2020

1   First Midterm

The exam was out of 100 points: 10 points for short answer; 40 points for translation; 50 points for derivations.

The average score was 70. The median score was 78. The distribution was flat in the middle but high on the ends:

F	D-	D	D+	C-	C	C+	B-	B	B+	A-	A
0-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90-100
7	2	4	0	2	2	3	3	5	6	8	7

1.1   Corrections

If you scored a low grade on this exam, I **strongly encourage** you to come to my office office hours so we can talk about what went wrong.

If you scored below 55, I **strongly encourage** you to submit **corrections**. I will "regrade" your corrected exam, and adjust the grade (only up, never down) according to the following scale:

adjusted grade:	D	D+	C-
regrade score:	70+	80+	90+

You only need to correct the problems you got wrong. Your corrections need to be **on separate paper**, not on the original exam. When I regrade, I will give **no partial credit**: every problem that missed any points will be reset to zero points. To earn those points back, you need to provide the correct answer and *show your work* as follows:

- For the two point problems, indicate the correct answer, and briefly explain your mistake.

- For the symbols-to-English problems, use the method described in Chapter 3 to solve each problem you got incorrect, and show each step. For example:

  $(P \rightarrow Q) \rightarrow (Q \rightarrow P)$
  If $(P \rightarrow Q)$ then $(Q \rightarrow P)$
  If (if P then Q) then (if Q then P)
  If (if education is a priority then education will be funded) then (if education will be funded then education is a priority)

- For the English-to-Symobls problems, use solve each problem you got incorrect, again, showing your work. For example:

  Education will be funded only if it is a priority, only if the state is not bankrupt.
  P only if Q, only if not S.
  (if P then Q), only if not S.
  If (if P then Q), then not S.
  If $(P \rightarrow Q)$, then $\neg S$.
  $(P \rightarrow Q) \rightarrow \neg S$.

- For the derivations, I want to see complete correct derivations.

2 Derived Rules

Chapter 7 introduces derived rules. A derived rule is a *shortcut* that you enable by deriving a given pattern of argument. You can't use these rules until *you* derive them, in Carnap, and add them to your index of derived rules.

Chapter 7 discusses the following rules:

Hypothetical Syllogism (D-HS) $\phi \to \psi, \psi \to \chi \vdash \phi \to \chi$
Material Conditional (D-MC) $\psi \vdash \phi \to \psi$
Material Conditional 2 (D-MCN) $\neg\phi \vdash \phi \to \psi$
Contraposition (D-CP) $phi \to \psi \vdash \neg\psi \to \neg\phi$
Contraposition 2 (D-CPN) $\neg\phi \to \neg\psi \vdash \psi \to \phi$
Dilemma (D-DI) $\phi \to \psi, \neg\phi \to \psi \vdash \psi$
Consequentia Mirabilis (D-CM) $\neg\phi \to \phi \vdash \phi$
Ex Falso Quodlibet (D-XQ) $phi, \neg\phi \vdash \psi$

You need to *derive* each of these before you can solve problems using them.