Thinking Straight Critical Reasoning Workshop 4-1 (April 22, 2008)

I   A. (Individually) review the answers for the assignment given on the last pages:

B. In small group
(1) Discuss any items that you found difficult as especially your criticism for **Exercise 4.4 #1b and (#1h or #1j)**
(2)   If you would like to volunteer to put a reconstruction and criticism of the argument in one of the letters to the editor from Friday's workshop, discuss it with your group. For each letter, a person will be selected to put the reconstruction in standard form on the board.

C. Plenary discussion of any remaining problems, criticism of **Exercise 4.4,** discussion of reconstructions and criticisms of letters to the editor.

II Introduction to More formal approach to validity
Translation into Formalism,

Symbol	Name	Example	Rough English Equivalent
¬	Negation	¬ A	It is not the case that A
&	Conjunction	A & B	A and B
∨	Disjunction	A∨ B	Either A or B (or both)
→	Conditional	A → B	If A, then B
↔	Biconditional	A ↔ B	A if and only if B

TRANSLATION INTO FORMALISM

a.   If the next session of Congress does not continue to really limit the deficit, then the long-term economic outlook for the United States is bleak.
b   Either China or the European Union will be the economic power of the year 2020.
c   If the United States remains the world's greatest debtor nation, then either China or the European Economic Community will be the economic power of the year 2020.
d   Both United States and the European Union face significant economic challenges from China and other Asian countries..
e.   It is not the case that the United States will not improve economically.
f.   The U.S. economic future looks bleak now, but we can overcome the obstacles if we again reward long-term economic investment. **[Hint:** *But* **can typically be translated like "and."]**
g.   The United States will continue to decline economically unless it can become the technological leader in the new, green energy economy. **[Hint:** *Unless* **can often be translated like "or."]**
h.   The United States will improve its economic position only if it can become the technological leader in the new, green energy economy. **[Hint:** *A only if B* **can often be translated like "If A, then B.")**
i.   Neither good intentions by the present administration nor reliance on an unfettered free market will improve the economic conditions in the United States. **[Hint:** *Neither A nor B* **can be translated like "It is not the case that either A or B" and also like "It is not the case that A, and it is not the case that B." the latter two statements in a sense say the same thing.]**
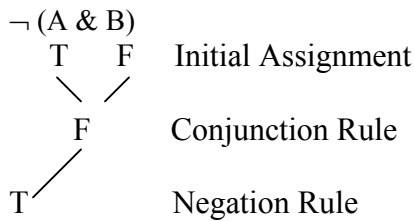
III DETERMINING TRUTH OF COMPLEX STATEMENTS

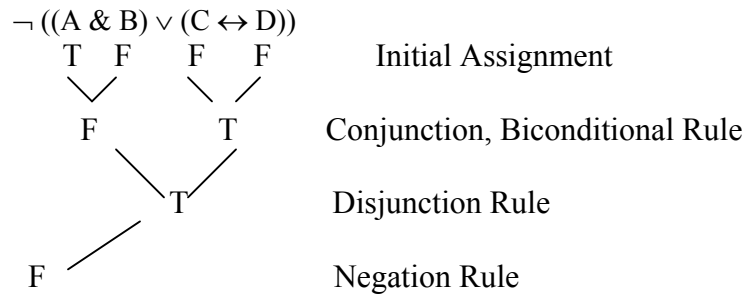### DEFINITION OF THE CONNECTIVES

Negation

Row	□	¬ □
1	T	F
2	F	T

Possible Situations		*Conjunction*	*Disjunction*	*Conditional*	*Biconditional*
Row	□ Δ	□ & Δ	□ ∨ Δ	□ → Δ	□ ↔ Δ
1	T T	T	T	T	T
2	T F	F	T	F	F
3	F T	F	T	T	F
4	F F	F	F	T	T

Sample A

¬ (A & B)
  T   F   Initial Assignment
   \ /
    F   Conjunction Rule
   /
  T   Negation Rule

Sample B

¬ ((A & B) ∨ (C ↔ D))
  T F   F   F   Initial Assignment
   \/   \ /
   F   T   Conjunction, Biconditional Rule
    \   /
     T   Disjunction Rule
      \ /
       F   Negation Rule

1 .Assume the following initial assignment of truth values to the statements: A is T(rue), B is F(alse). Use the techniques of evaluation listed above to evaluate the truth value of the following compound statements. Be sure to list the appropriate row and connective to justify each step in the evaluation

   a.   A → ¬ B
   b. ¬ B →   A

2. Assume the following initial assignment of truth values to the statements: A is F(alse), B is T(rue), C is F(alse). Create evaluation diagrams for the following compound statements. (You don't need to list a justification for each step, but you should note to yourself how the definitions apply to each move you make.)

   a.   A → (B ∨ C)
   b. (A ∨ B) → C

IV USING TRUTH TABLES TO DETERMINE VALIDITY OF ARGUMENTS

Validity Disjunctive Argument

	Initial Assignments		*Evaluation of Statements for These Assignments*		
	Possible Situations		*Premises*		*Conclusion*
	A	*B*	*A* ∨ *B*	¬ *A*	*B (Repeated)*
1	T	T	T	F	T
2	T	F	T	F	F
3	F	T	**T**	**T**	**T**
4	F	F	F	T	F

No possible situation in which premises all true and conclusion is false (only one situation row 3 has both premises true and in this situation the conclusion is also true

Compare this to Fallacy of Affirming the Consequent—an INVALD argument form

	Initial Assignments		*Evaluation of Statements for These Assignments*		
	Possible Situations		*Premises*		*Conclusion*
	A	*B*	*A* → B	*B (Repeated)*	*A (Repeated)*
1	T	T	T	T	T
2	T	F	F	F	T
3	F	T	**T**	**T**	**F**
4	F	F	T	F	F

Here there IS as possible situation (Row 3) in which both premises are True and the conclusion False. So the form can't be valid,

Individually: 1. Complete the table below to show whether the argument represented is valid or invalid

	Initial Assignments		*Evaluation of Statements for These Assignments*		
	Possible Situations		*Premises*		*Conclusion*
	A	*B*	*A* → B	¬B	¬ *A*
1	T	T			
2	T	F			
3	F	T			
4	F	F			

2. Use a truth table to determine whether the following argument is valid or invalid
(1) Either A or B
∴ If not A, then B

(Individually) Fill in the following table for a three premise argument with three separate statement letters (hence $2^3 = 8$ possible situations)

Initial Assignments				*Premises*			*Conclusion*
A	**B**	**C**	**A → B**	**B → C**	**¬ A**		**C**
1	T	T	T				
2	T	T	F				
3	T	F	T				
4	T	F	F				
5	F	T	T				
6	F	T	F				
7	F	F	T				
8	F	F	F				

Use the truth table method to determine whether an argument of the following form is deductively valid
   (1) A if an only if B
   (2) If B, then C
   (3) Not C
   ∴ A

➡ **Assignment for Friday April 25:** **Review**: ch 5 pp. 129-135 on Venn diagrams and validity of arguments with quantifiers. **Read:** Ch. 6 on fallacies and chapter 7 to p. 179. **Submit: Exercise 5.1** #1 b, d, f, h , #2 b, d, #4 b,d ; **Exercise 5.2** #2, #3 b, d, f; **Exercise 5.3** #1 a #2 b, #3 b, f, g, l, n **; Submit Portfolio** containing at least four (4) items (editorials, letters to editor, opinion pieces, short internet selection, short section from book or longer article, etc); for at least two (2) reconstruct an argument into standard form (with missing, implicit premises or conclusion supplied if necessary); evaluate at least one (1) of those you reconstructed by indicating whether it is valid (using the methods of chapter 4 or 5) and if so whether it is sound by casting doubt, if appropriate, on the premises.

Answers to Assignment for today Check your own assignment. Put a check √ next to answers that are similar, an **X** next ones that miss the mark, and a question mark **?** next to any that are problematic

Exercise 4.1, #6, #8, #10

   6. (1) All doctors have studied medicine.
      (2) Paul is not a doctor.
      ∴ Paul has not studied medicine.

Invalid Pattern

   (1) All P1's are P2's.
   (2) m is not a P1.
   ∴ m is not a P2.

Counterexample
    (1) All cities in Tennessee are in the U.S.
    (2) New Orleans is not in Tennessee.
    ∴ New Orleans is not in the U.S.

Describing an Invalidating Possible Situation: (People other than doctors study medicine.) Paul could be a scientist studying physiology, or even a medical sociologist studying the medical profession, but not a medical doctor.

8. (1) Stocks in technology will be strong.
    (2) If nanotechnology is the business opportunity of the future, then it
        will attract more investment.
    (3) If it will attract more investment, stocks in technology will be strong

    ∴ Nanotechnology is the business opportunity of the future.

Invalid Pattern

(1) S.
(2) If N, then I.
(3) If I, then S.

∴ N.

Counterexample
    (1) Tigers are animals.
    (2) If tigers are canines, then they are mammals.
    (3) If tigers are mammals, then tigers are animals.

    ∴ Tigers are canines.

Describing an Invalidating Possible Situation: The first premise could be true , but not because the conclusion is true. For example, stocks in technology might be strong because other technologies (cellular communication, biotechnology) will become even more important and the aging "Baby Boomers" will be frantically investing for their upcoming retirement, even though nanotechnology never really becomes a profitable technology itself.

10. (1) Either we ration health care or we will spend too much on health
       care.
    (2) We will ration health care.

    ∴ We will not spend too much on health care.

Invalid Pattern

(1) Either R or S.
(2) R.

∴ Not S.

Counterexample
    (1) I should treat my spouse lovingly through words or through
      deeds.
    (2) I should treat my spouse lovingly through words.

    ∴ I should not treat my spouse lovingly through deeds.

Describing an Invalidating Possible Situation: (We could do both.) We could ration health care but also spend toomuch on health care because we do not hold down the
cost of medical treatment for the fewer cases we do cover.

Exercise 4.2 #2, #4, #6

2.   We might be justified in promising to return a book even though we know that a variety of factors, such as a house fire, might make the promise impossible to keep. To demand nearly absolute certainty of being able to keep a promise would rule out all but a few promises. Such a stipulation, if actually carried out in practice, would virtually eliminate the ever-useful custom of making promises. See the discussion of Example 7.7 for further aspects of this case.

4. Not everything connected to the body is a part of it. A bullet fragment or a piece of shrapnel might be connected to the body by being embedded in it but is not a part of it. Similarly, tumors, warts, or other growths might be considered connected to the body but not an integral part of it. Finally, conjoined twins are connected but are not part of each other.

6. Two people could live together effectively without being very compatible. One could work days, the other work nights. Even if two incompatible individuals would have to spend more time in each other's presence, they might have good reason for doing so—say economic reasons— and might be able to make special arrangements—say living in different parts of the house. See the discussion of Example 7.7 for further aspects of this case.

Exercise 4.3 #1 b,d, #3(i) b,d,3 #3(ii) b,d;

1b. The conclusion does not follow, and for all but one person the second premise is false.
1d. The conclusion follows and all premises are true (a sound argument).

3(i)b. Misuse of terms;   3(i)d. Sensible use of terms;   3(ii)b. Consistent;   3(ii)a. Inconsistent

Exercise 4.4 #1b and (#1h or #1j)

1b. (1) If the United States were democratic, each person's opinion would have a significant effect on government.
(2) Each person's opinion does not have a significant effect on government. (IMPLICIT)

∴ The United States is not democratic.

The conclusion follows from the premises, but the premises are doubtful. If "having a significant effect on government" means, for example, being able to vote in elections and having your vote counted, then the implicit premise is doubtful. At least, each adult who is eligible to vote can do so. If "having a significant effect on government" means having government do what each person wants, then the implicit premise is true but the stated premise is clearly false. Such a requirement would be impossible for a government to fulfill.

1h. (1) People have a right to do whatever they want with their own bodies.
(2) A fetus is part of a pregnant woman's body. (IMPLICIT)

∴ A pregnant woman has the right to have the fetus aborted if she wants to.

The conclusion follows from the premises. If being part of one's body simply means being connected to one's body, then the implicit premise is true, but the stated premise is doubtful. If you connected a weapon to your hand, for example, you wouldn't have a right to do whatever you wanted with it. Nor would you have such a right if you somehow attached yourself physically to another person (say with handcuffs). If the stated premise is qualified to be made more acceptable, the implicit premise becomes difficult to maintain. For example, if a person is allowed to do anything with a part of her own body that doesn't adversely affect any other person, then it might be replied that the arguer must not simply assume that the fetus is not another person.

1j.
(1) Getting married involves promising to live with a person for the rest of one's life.
(2)
another person for life.

(3)
can't live together.   IMPLICIT

(4) No one should make a promise unless she or he can safely predict that she or he can keep it. IMPLICIT

∴ No one should get married

Criticism: see criticism of Exercise 4.2 #2 and #6 above. For an more elaborate criticism , see Example 7.7 and related text beginning on p. 183 of the text.