

EXERCISES ON THE RULES OF PROPOSITIONAL LOGIC

For each of the following, consider the following truth table. Yet before you fill it out, read the questions. Each question shall tell you which *part* to fill out (and *when* to do so). Answer the questions in order. If you don't do so, then you are putting yourself at a higher risk of giving an inaccurate answer. Follow the directions. (If you *disregard* the directions, then you *disadvantage* yourself.)

<u>1st column</u>	<u>2nd column</u>	<u>3rd column</u>	<u>4th column</u>	<u>5th column</u>	<u>6th column</u>	<u>7th column</u>	<u>8th column</u>	<u>9th column</u>	<u>10th column</u>
Q	~Q	Q ∧ ~Q	~Q ∧ Q	~Q ∧ ~~Q	Q ∨ ~Q	~Q ∨ Q	~Q ∨ ~~Q	~(Q ∧ ~Q)	~(Q ∨ ~Q)

Each question has two parts. *First*, the question will give tell you to complete some column in the truth table. *Then*, the question will ask you to select from one of the following *seven* logical rules.

- (a) The Principle of Bivalence
- (b) The Law of Contradictories
- (c) The Law of NonContradiction
- (d) The Law of the Excluded Middle
- (e) Logical Equivalence *vis-à-vis* Double Negation Elimination
- (f) Logical Equivalence *vis-à-vis* De Morgan's Law(s)
- (g) Logical Equivalence *vis-à-vis* the Commutativity Property

Since there are twelve questions, each question is $8\frac{1}{3}\%$ of the entire grade. Accordingly, answer the following *twelve* questions, and make sure to follow the directions!

1. Complete *only* the 1st column of the truth table. To complete the truth table, *which* logical rule did you use? In other words, which logical rule is exhibited by the *truth-values* (or *logical values*) in the 1st column? Select one of the *seven* options from (a) through (g).
2. Based on how you completed the 1st column of the truth table, complete the 2nd column of the truth table. To complete the truth table, *which* logical rule did you apply? In other words, which logical rule is exhibited in the 1st & 2nd columns in the truth table? Select one of the *seven* options from (a) through (g).
3. First to consider *conjunction*, complete the 3rd column of the truth table. *Which* logical rule is exhibited in the 3rd column? Select one of the *seven* options from (a) through (g).
4. Based on how you completed the 3rd column of the truth table, complete the 9th column of the truth table. *Which* logical rule did you apply? Select one of the *seven* options from (a) through (g).
5. Complete the 4th column, and notice the logical equivalence exhibited by the 3rd & 4th columns. What is the most *accurate* way of characterizing the equivalence that is exhibited in those two columns? Select one of the *seven* options from (a) through (g).

6. Complete the 5th column of the truth table, and notice the logical equivalence exhibited by the 4th & 5th columns. What is the most *accurate* way of characterizing the logical equivalence that is exhibited in those two columns? Select one of the *seven* options from (a) through (g).

7. Now to consider *disjunction*, complete the 6th column of the truth table. *Which* logical rule is exhibited in the 6th column? Select one of the *seven* options from (a) through (g).

8. Based on how you completed the 6th column of the truth table, complete the 10th column of the truth table. *Which* logical rule did you apply? Select one of the *seven* options from (a) through (g).

9. Now that you have completed the 5th and 10th columns of the truth table, notice the logical equivalence that is exhibited in those two columns. Accordingly, what is the most *accurate* way of characterizing the logical equivalence that is exhibited in those two columns? Select one of the *seven* options from (a) through (g).

10. Complete the 7th column, and notice the logical equivalence exhibited by the 6th & 7th columns. What is the most *accurate* way of characterizing the equivalence that is exhibited with those two columns? Select one of the *seven* options from (a) through (g).

11. Now to complete the *entire* truth table, complete the 8th column, and notice the logical equivalence exhibited by the 7th & 8th columns. What is the most *accurate* way of characterizing the logical equivalence that is exhibited in those two columns? Select one of the *seven* options from (a) through (g).

12. Now that you have completed the *entire* truth table, notice the logical equivalence exhibited by the 8th and 9th columns of the truth table. Accordingly, what is the most *accurate* way of characterizing the equivalence that is exhibited in those two columns? Select one of the *seven* options from (a) through (g).