

Review for Exam 2
Math 102
Answers

Complete the following exercises for a review. Questions on the exam will be similar to questions on this review, questions from the homework assignments and the suggested exercises.

- Determine whether the person in each example is using inductive or deductive reasoning.
 - Inductive
 - Deductive
- Let s represent the statement "Steve will go to the store", b represent the statement "Steve will buy bread", m represent the statement "Steve will buy milk", and e represent the statement "Steve will buy eggs". Translate the following statements into symbolic form.

- | | | |
|--------------------------------------|---------------------------------------|--------------------------------|
| (a) $\sim s \vee \sim m$ | (e) $\sim (s \vee m)$ | (i) $s \rightarrow e$ |
| (b) $s \rightarrow (m \vee e)$ | (f) $s \rightarrow (\sim m \wedge b)$ | (j) $s \rightarrow m$ |
| (c) $(m \wedge b) \leftrightarrow s$ | (g) $\sim (b \wedge e)$ | (k) $s \rightarrow b$ |
| (d) $s \rightarrow \sim m$ | (h) $(e \wedge b) \rightarrow s$ | (l) $s \rightarrow (m \vee e)$ |

- $\sim s \wedge \sim m$: Steve will not go to the store and he will not buy milk.
 $\sim b \vee \sim e$: Steve will not buy bread or he will not buy eggs.
- $2(d)$ Converse: $\sim m \rightarrow s$: If Steve will not buy milk then he will go to the store.
Inverse: $\sim s \rightarrow m$: If Steve will not go to the store then he will buy milk.
Contrapositive: $m \rightarrow \sim s$: If Steve buys milk then he will not go to the store.
 $2(h)$ Converse: $s \rightarrow (e \wedge b)$: If Steve goes to the store then he will buy eggs and bread.
Inverse: $\sim (e \wedge b) \rightarrow \sim s$: If Steve does not buy eggs and bread then he will not go to the store.
Contrapositive: $\sim s \rightarrow \sim (b \wedge e)$: If Steve does not go to the store then he will not buy eggs and milk.

5. Let them eat cake.

6. Write the negation of each of the following statements in two different ways.

- Some students do not enjoy going to class.
At least one student does not enjoy going to class.
- No trees are native to North Dakota.
All trees are not native to North Dakota.
- All cows have spots.
Every cow has spots.
- Some birds do give live birth.
There is a bird that gives live birth.

7. Compute a truth table for the following statements.

- | | |
|------------|--------------|
| (a) $TFFT$ | (d) $TTTT$ |
| (b) $FTFF$ | (e) $FTFFFF$ |
| (c) $TTFT$ | (f) $FTFFFT$ |

8. State which form the following arguments follow and whether they are valid or not.

- (a) Law of Contraposition. Valid.
- (b) Fallacy of the Inverse. Invalid.
- (c) Law of Detachment. Valid.
- (d) Disjunctive Syllogism. Valid
- (e) Fallacy of the Converse. Invalid.
- (f) Syllogism. Valid.

9. Use truth tables to determine whether the following arguments are valid.

- (a) Compute a truth table for $[(p \rightarrow q) \wedge (\sim q \rightarrow r)] \rightarrow (\sim p \rightarrow r)$
TTTTFTTT, Invalid
- (b) Compute a truth table for $[((p \vee q) \rightarrow r) \wedge (p \vee q)] \rightarrow r$
TTTTTTTT, Valid

10. Fill in the reasons for the two column proof of the following argument.

$$\begin{array}{l} (q \vee r) \rightarrow p \\ s \rightarrow q \\ \hline \sim p \\ \hline \therefore \sim s \end{array}$$

Statement	Reason
1. $(q \vee r) \rightarrow p$	premise
2. $s \rightarrow q$	premise
3. $\sim p$	premise
4. $\sim (q \vee r)$	1,3, Law of Contraposition
5. $\sim q \wedge \sim r$	4, DeMorgan's Laws
6. $\sim q$	5, Simplification
7. $\therefore \sim s$	2,6, Law of Contraposition

11. Use Euler Diagrams to determine whether the following syllogisms are valid.

