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Professor Nguyen

MATH 2317 - 1

Second assignment

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Homework – 2

1) (e) Jim is not inside or Jan is not at the pool.

2) (e) Jim has not grown and Joan has not shrunk.

3) a) The variable S is not undeclared or the data are not out of order.

b) The variable S is not undeclared and the data are not out of order.

c) Al was with Bob on the first, and Al is not innocent.

d) x <−5 or x ≥ 2

4)

p q ((p ∨ q) → p)

F F T

F T F

T F T

T T T

p q (p ∨ (¬p ∧ q))

F F F

F T T

T F T

T T T

The third column of the Truth table is not the same on both truth tables, that’s why it is

not logically equivalent.

5) Two statement forms are logically equivalent if, and only if, their resulting truth tables

are identical for each variation of statement variables

Two statement forms are called logically equivalent if, and only if, they have identical

truth values for each possible substitution of statements for their statement variables. The

logical equivalence of statement forms P and Q is denoted by writing P ≡ Q.

Two statements are called logically equivalent if, and only if, they have logically

equivalent forms when identical component statement variables are used to replace

identical component statements.

6) If Sam bought it at Crown Books, then Sam didn't pay full price.

Sam bought it at Crown Books or Sam paid full price. →

p = Sam bought it at Crown Books

q = Sam paid full price

a) p → ¬(q)

b) p ∨ q

Truth Table:

a)

p q (p → ¬q)

F F T

F T T

T F T

T T F

b)

p q (p ∨ q)

F F F

F T T

T F T

T T T

Since the truth tables of p → ¬(q) and p ∨q are not identical truth values, the two

statements are not logically equivalent.

7) If Sam is out of Schlitz, then Sam is out of beer.

Sam is not out of beer or Sam is not out of Schlitz. →

p = Sam is out of Schlitz

q = Sam is out of beer

a) p → q

b) ¬(p) ∨ ¬(q)

Truth Table:

a)

p q (p → q)

F F T

F T T

T F F

T T T

Truth Table:

b)

p q (¬p ∨ ¬q)

F F T

F T T

T F T

T T F

Since the truth tables of (p → q) and (¬p ∨¬q) are not identical truth values, the two

statements are not logically equivalent.

8) Write the converse, inverse, and contrapositive of "If Ann is Jan's mother, then Jose is

Jan's cousin."

p = Ann is Jan’s mother

q = Jose is Jan’s cousin

Converse: If Jose is Jan’s cousin, then Ann is Jan’s mother.

Inverse: If Ann isn’t Jan’s mother, then Jose isn’t Jan’s cousin.

Contrapositive: If Jose isn’t Jan’s cousin, then Ann isn’t Jan’s mother

9) Write the converse, inverse, and contrapositive of "If Ed is Sue's father, then Liu is

Sue's cousin."

p = Ed is Sue's father

q = Liu is Sue's cousin

Converse: If Liu is Sue's cousin, then Ed is Sue's father.

Inverse: If Ed isn’t Sue's father, then Liu isn’t Sue's cousin.

Contrapositive: If Liu isn’t Sue's cousin, then Ed isn’t Sue's father.

10) Write the converse, inverse, and contrapositive of "If Al is Tom's cousin, then Jim is

Tom's grandfather."

p = Al is Tom's cousin

q = Jim is Tom's grandfather

Converse: If Jim is Tom's grandfather, then Al is Tom's cousin.

Inverse: If Al isn’t Tom's cousin, then Jim isn’t Tom's grandfather.

Contrapositive: If Jim isn’t Tom's grandfather, then Al isn’t Tom's cousin.

11) Rewrite the following statement in if-then form without using the word "necessary":

Getting an answer of 10 for problem 16 is a necessary condition for solving problem 16

correctly.

If you want to solve problem 16 correctly, then you should get an answer of 10 for

problem 16.

12) State precisely (but concisely) what it means for a form of argument to be valid.

An argument consists of several premises and a final conclusion.

An Argument is said to be Valid,

If All the Premises are true, then the conclusion is also true.