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CS-225: Discrete Structures in CS

Homework 1, Part 2

Exercise Set #2.2: Problem #11, #15, #20(b, c, e ,g), #38, #41, #43, #45, #50

#11.

p	q	r	q → r	p → (q → r)	p ∧ q	(p ∧ q) → r	(p → (q → r)) ↔ ((p ∧ q) → r)
T	T	T	T	T	T	T	T
T	T	F	F	F	T	F	T
T	F	T	T	T	F	T	T
T	F	F	T	T	F	T	T
F	T	T	T	T	F	T	T
F	T	F	F	T	F	T	T
F	F	T	T	T	F	T	T
F	F	F	T	T	F	T	T

#15.

p	q	r	q → r	p → (q → r)	p → q	(p → q) → r
T	T	T	T	T	T	T
T	T	F	F	F	T	F
T	F	T	T	T	F	T
T	F	F	T	T	F	T
F	T	T	T	T	T	T
F	T	F	F	T	T	F
F	F	T	T	T	T	T
F	F	F	T	T	T	F

As shown by the highlighted columns, these two statement forms are not logically equivalent as their truth values differ.

#20.

b. Today is New Year's Eve and tomorrow is not January.

c. The decimal expansion of *r* is terminating and *r* is not rational.

e. x is nonnegative and x is not positive and x is not 0.

g. n is divisible by 6 and n is not divisible by 2 or n is not divisible by 3.

#38. If it does not rain, then Ann will go.

#41. If the triangle has two 45° angles, then the triangle is a right triangle.

#43.

1. If Jim does not do homework regularly, then Jim does not pass the course.
2. If Jim does pass the course, then Jim does his homework regularly.

#45. If the computer program is correct, then it does not produce error messages during translation.

#50.

a. $[\neg (\neg p \vee (\neg q \vee r)) \vee (\neg (p \vee q) \vee r)] \wedge [\neg (\neg (p \wedge q) \vee r) \vee (\neg p \vee (\neg q \vee r))]$

b. $[\neg (\neg (p \wedge (q \wedge \neg r)) \wedge ((p \wedge q) \wedge \neg r))] \wedge [\neg (\neg ((p \wedge q) \wedge \neg r) \wedge (p \wedge (q \wedge \neg r)))]$