Discrete Mathematics and Proof Unit 1 quiz 1: And and or: conjunction and disjunction, Building a truth table for a compound statement, Truth table for the conditional

Name _____ Date _____ Period _____

8 questions, 19 points

1. Let $a = 28$ and $b = 19$. Decide whether each sentence is true or false. (2 points)

(a) ($a > b$ and a is even) or $a + b$ is a multiple of 5.

(b) $a > b$ and (a is even or $a + b$ is a multiple of 5).

2. Build a truth table for $\neg(\neg P \vee Q) \vee Q$, with a column for every piece, rows in the fixed order. (2 points)

3. Without writing out the whole truth table, list every row of the table for $\neg P \wedge (Q \vee \neg R)$, letters P, Q, R in the fixed order, in which the statement is true. Explain how you found them. (2 points)

4. Consider the points $A(3, -2)$, $B(-1, -4)$, $C(0, 5)$, $D(-2, 0)$ and $E(4, 1)$ in the coordinate plane, each written as (x, y). (3 points)

(a) Which of the points make "$x > 0$ or $y > 0$" true?

(b) Which of the points make "$x > 0$ and $y > 0$" true?

(c) Describe every point (x, y) of the plane for which "$x > 0$ or $y > 0$" is false.

5. A greenhouse control panel records whether each of three alarms went off overnight. Let F be "the frost alarm went off", V be "the vent alarm went off" and W be "the water alarm went off". Mei reads two facts from the log: $\neg F \vee W$ is false, and $F \wedge V$ is false. Which alarms went off? Then find the truth value of $V \vee \neg W$. (2 points)

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6. The statement $\neg P \to (Q \wedge R)$ is a conditional. Name its hypothesis and its conclusion, find the rows of the table (letters P, Q, R in the fixed order) where the hypothesis is true and where the conclusion is false, and from those find every row in which the whole statement is false. (2 points)

7. Build a truth table for $\neg(Q \vee \neg R) \vee (P \wedge \neg Q)$, with a column for every piece, rows in the fixed order P, Q, R. (3 points)

8. A smoke detector's manual says: "If there is smoke in the room, the alarm sounds." Let P be "there is smoke in the room" and Q be "the alarm sounds", and suppose the manual's statement $P \to Q$ is true. Answer each part from the rows of the table for $P \to Q$. (3 points)

(a) The alarm is sounding. Must there be smoke in the room?

(b) The alarm is silent. Is there smoke in the room?

(c) One evening the alarm sounds with no smoke in the room, only steam from a shower. Does that show the manual's statement is false?

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