Name ____ Test 1, Fall 2019

Part 1: Definitions and Concepts

1) Construct a truth table for $(P \vee Q) \Rightarrow Q$
(50 points)

2) For the statement below, (a) Identify the individual statements and (b) Identify the statement form

"If x and y are both positive, then $x + y$ is positive."

(50 points)

3) Give the definition of divides. Be mathematically precise and use the variables x and y to define what it means to say “$x|y$”. Vague answers will be given no credit.
(50 points)

4) Give the definition of even. Be mathematically precise, vague answers will be given no credit.
(50 points)

5) Find the negation of the statement below.
(50 points)

$$\forall_{x\in\mathbb{R}}\exists_{y\in\mathbb{R}}(2x+3y=7)$$

6) Determine the truth value of the statements below. (10 points each)

- $\forall_{x\in\mathbb{R}}(x\neq 0)$
- $\exists_{x\in\mathbb{R}}(x\neq 0)$
- $\forall_{x\in\mathbb{R}}\forall_{y\in\mathbb{R}}(xy=0)$
- $\forall_{x\in\mathbb{R}}\exists_{y\in\mathbb{R}}(x^2+xy=0)$
- $\exists_{x\in\mathbb{R}}\forall_{y\in\mathbb{R}}(x^2+xy=0)$

Part 2: Proofs

7) Below is a partial proof of the statement below. Finish the proof.

“If $x > 2$, then $2x + 5 > 4$”

(100 points)

Line	Statement	Reasoning
(1)	$x > 2$	____
(2)	$2x > 4$	____
(3)	$2x + 5 > 2x$	Algebra on line 2 (____)
(4)	_________________	Transitive property of “$<$” applied to lines 2 and 3.

8) Construct a formal proof to show that the statement below is valid.

$$\left((P \wedge Q) \wedge \left(P \Rightarrow (Q \vee R)\right) \wedge \sim Q\right) \Rightarrow R$$

(100 points)

9) Prove the statement below.

$$\exists_{x\in\mathbb{R}}\exists_{y\in\mathbb{R}}(x+y=7)$$

(100 points)