Math 308 Quiz 2

June 4, 2015

Name: ANSWERS

Instructions: Answer all problems in the space provided.

1. What is a statement? : a declarative sentence that is true or false (not both).

2. True or false (T or F): If $\{1\} \in P(A)$, then $1 \in A$ but $\{1\} \notin A$. F

3. Justify your answer above: $A = \{1, \{1\}\}$, then $\{1\} \in P(A)$ and $\{1\} \in A$.

4. Let $I = [0, \infty)$ and let $r \in I$, define: $A_r = \{(x, y) \in \mathbb{R}^2 \mid x^2 + y^2 = r^2\}$, $B_r = \{(x, y) \in \mathbb{R}^2 \mid x^2 + y^2 \leq r^2\}$, and $C_r = \{(x, y) \in \mathbb{R}^2 \mid x^2 + y^2 > r^2\}$, then:

   (a) $\bigcup_{r \in I} A_r = \mathbb{R}^2$ $\qquad \bigcap_{r \in I} A_r = \emptyset$

   (b) $\bigcup_{r \in I} B_r = \mathbb{R}^2$ $\qquad \bigcap_{r \in I} B_r = \{(0,0)\}$

   (c) $\bigcup_{r \in I} C_r = \mathbb{R}^2 - \{(0,0)\}$ $\qquad \bigcap_{r \in I} C_r = \emptyset$

5. For $n \in \mathbb{N}$, let $A_n = \left(-\frac{1}{n}, 2 - \frac{1}{n}\right)$. What is:

   $\bigcup_{n \in \mathbb{N}} A_n = (-1, 2)$ $\qquad \bigcap_{n \in \mathbb{N}} A_n = (0, 1)$

Bonus problems:

1. Draw a truth table for $P \Rightarrow Q$:

P	Q	$P \Rightarrow Q$
T	T	T
T	F	F
F	T	T
F	F	T

2. For the statement $P \Rightarrow Q$, what is:

   (a) Its converse? $Q \Rightarrow P$

   (b) Its inverse? $\sim P \Rightarrow \sim Q$

   (c) Its negation? $P \wedge (\sim Q)$

FYI: Its contrapositive: $\sim Q \Rightarrow \sim P$

An equivalent statement to $P \Rightarrow Q$ is $(\sim P) \vee Q$.