Set Theory Questions

August 31, 2021

Question 1

Let A be the set A= $\{\mathbb{Q}, \{\mathbb{C}\}, \text{pumpkin pie}, \text{turtle}, \mathbb{N}\}$. Then

a)Is $\mathbb{C} \in$ A? Why or why not? (1)

b)Is the set $B = \{\text{pumpkin pie}\} \subseteq A$?Why or why not? (2)

c)Is turtle $\subseteq A$?Explain (3)

Question 2
Consider the set $\{x \in .[0, 2\pi] : sin(x) = 0\} \times \{2, 3\}$. Viewed as a subset of $\mathbb{R}^2$ graph this Cartesian Product.

Question 3
Describe the set A= $\{13a + 6b : a, b \in \mathbb{Z}\}$? (Hint: Think of some set B that you know, and show that $A \subseteq B$ and $B \subseteq A$ to conclude that A=B)

Question 4- Challenge Question
Consider the set $\mathcal{A} = \{X : X \text{ is a set and X} \notin X\}$ In other words $\mathcal{A}$ is the set of all sets who do not contain themselves as an element. Then consider: is $\mathcal{A} \in \mathcal{A}$? This question is called Russel's paradox (section 10 in book) and lead to a huge crisis in mathematics in the early 20th century.