

Mathematics 3A03 Real Analysis I
Fall 2019 ASSIGNMENT 6

This assignment is **due** on **Tuesday 3 December 2019 at 2:25pm**.

PLEASE NOTE that you must **submit online** via [crowdmark](#).

You will receive an e-mail from [crowdmark](#) with the required link.

Do **NOT** submit a hardcopy of this assignment.

1. Recall from class that we defined a **real number** to be a subset $\alpha \subseteq \mathbb{Q}$ with the following four properties:

1. $\forall x \in \alpha$, if $y \in \mathbb{Q}$ and $y < x$, then $y \in \alpha$;
2. $\alpha \neq \emptyset$;
3. $\alpha \neq \mathbb{Q}$;
4. there is no greatest element in α : $\forall x \in \alpha$, $\exists y \in \alpha$ so that $y > x$.

Assume α and β are real numbers, and define their **sum** $\alpha + \beta$ to be

$$\alpha + \beta = \{a + b \mid a \in \alpha, b \in \beta\}.$$

Use the formal definition above to show that $\alpha + \beta$ is a real number.

2. Prove that the series

$$\sum_{n=1}^{\infty} \frac{x}{n(1 + nx^2)},$$

converges uniformly on \mathbb{R} .

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