CS-170: Modelling Computing Systems 1 **Practical Week 10**

3 December 2019

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1. Computers cannot do exact arithmetic; they represent approximations of real numbers using floating-point arithmetic. It is thus impossible to test if two real numbers are equal; the best we can do is test to see if they are approximately equal. Let us say that two real numbers x and y are *approximately equal*, and write $x \approx y$, if, and only if, they differ by no more than $1/1\,000\,000$. Thus, the relation $\approx$ on $\mathbb{R}$ is defined as follows:

$$\approx \;=\; \left\{ (x, y) \;:\; |x - y| < \frac{1}{1000000} \right\}$$

Intuitively this ought to be an equivalence relation (reflexive, symmetric and transitive). Explain why it isn't.

ANSWER:

2. Match the property of the binary relation R on A listed on the left to a characterisation of that property on the right:

ANSWER:

reflexive ●	● $R \circ R \subseteq R$
irreflexive ●	● $\mathrm{id}_A \cap R = \emptyset$
symmetric ●	● $R = R^{-1}$
antisymmetric ●	● $\mathrm{id}_A \subseteq R$
transitive ●	● $R \cap R^{-1} \subseteq \mathrm{id}_A$