MAT320/640, Fall 2021 **Renato Ghini Bettiol**

Homework Set 3

DUE: OCT 13, 2021 (VIA BLACKBOARD, BY 11.59PM)

To be handed in:

Please remember that all problems will be graded!

1. Write a detailed and rigorous proof (i.e., finding $N \in \mathbb{N}$ in terms of the given $\varepsilon > 0$) that the sequence
$$s_n = 2021\left(1 + \frac{(-1)^n}{n}\right), \quad n \in \mathbb{N}$$
converges to $L = 2021$.

2. Regarding the above sequence $s_n = 2021\left(1 + \frac{(-1)^n}{n}\right)$, answer (with justification) each of the following questions:
   (a) Is $(s_n)_{n\in\mathbb{N}}$ bounded?
   (b) Is $(s_n)_{n\in\mathbb{N}}$ a Cauchy sequence?
   (c) Does $(s_n)_{n\in\mathbb{N}}$ have a subsequence $(s_{n_k})_{k\in\mathbb{N}}$ that converges to 0?