MATH 201 SPRING 2023 PRACTICE TEST #2

Write clearly, on separate paper.

(1) [5pts.] Consider the subset $E = \{x \mid 2^x < 3\}$ of $\mathbb{Q}$.
   (a) Show that E is a bounded above in $\mathbb{Q}$.
   (b) Show that no rational number can be the least upper bound of E.

(2) [4pts.] Find a number M such that $|x^3 - 3x^2 - 10| \leq M$ for all $-3 \leq x \leq 2$. Justify your claim.

(3) [5pts.] Consider the subset $E = \{x_1, x_2, x_3\}$ of $\mathbb{R}$. Show that

$$\max\{|x_1 - x_2 + x_3|, |x_2 - x_3 + x_1|, |x_3 - x_1 + x_2|\} \leq 3 \max\left\{|x| \,\middle|\, x \in E\right\}.$$