Time limit: 15 minutes.
Instructions: This tiebreaker contains 3 short answer questions. You will submit answers to the problem as you solve them, and may solve problems in any order. You will not be informed whether your answer is correct until the end of the tiebreaker. You may submit multiple times for any of the problems, but **only the last submission for a given problem will be graded**. The participant who correctly answers the most problems wins the tiebreaker, with ties broken by the time of the last correct submission.
No calculators.

1. Let the sequence $\{a_n\}$ for $n \geq 0$ be defined as $a_0 = c$, and for $n \geq 0$,

$$a_n = \frac{2a_{n-1}}{4a_{n-1}^2 - 1}.$$

   Compute the sum of all values of c such that a_{2020} exists but a_{2021} does not exist.

2. Real numbers x and y satisfy the equations $x^2 - 12y = 17^2$ and $38x - y^2 = 2 \cdot 7^3$. Compute $x + y$.

3. For integers a and b, $a + b$ is a root of $x^2 + ax + b = 0$. Compute the smallest possible value of ab.