Total time is 15 minutes. Number 1 is the regular quiz, i.e., 30 points. Once you finished completely with Number 1, you may work on Number 2, which is 30 points extra credit.

1. Let $r_n = 3 \cdot 2^n - 4 \cdot 5^n$ for $n \in \mathbb{N}_0$. Find r_0, r_1, r_2, and show that
$$\forall n \in \mathbb{N} \setminus \{1\} \quad r_n = 7r_{n-1} - 10r_{n-2}.$$
2. Let $a_0 = 2$ and $a_{n+1} = \frac{a_n}{2} + \frac{1}{a_n}$ for $n \in \mathbb{N}$. Show that $\{a_n\}$ converges and compute its limit.