Name (print): _____   **Signature:** _____

You have 30 minutes. Show your work. Notes not allowed! Problems are on both sides of this sheet.

Problem 1. (4 pts) Find the decimal expansion of $\dfrac{59}{165}$. Clearly show the repeating digits.

Problem 2. (6 pts) Write down explicit bijections:

(a) from natural numbers $\mathbb{N}$ to integers $\mathbb{Z}$;

(b) from integer numbers less or equal 44 to integers $\mathbb{Z}$.

Problem 3. (4 pts) Is the number $2.45632632632632\ldots$ rational or not? If yes, write it as a fraction. If not, give reasons.

Problem 4. (6 pts) Prove that $\sqrt{20}$ is not a rational number. Be careful about justifying all the steps that need justifying.