MATH 201 FALL 2019 PRACTICE FINAL

Write clearly, on separate paper. All questions carry equal weight.
You will receive credit for your five best answers.

(1) Prove or disprove:
Let A, B, and C be subsets of a set U.
Then $(C \setminus A) \cup (A \setminus B) = (A \cup C) \setminus B$.

(2) Prove or disprove:
The inequality $4x^2 + 9y^2 \geq 6xy$ holds
for all real numbers x and y.

(3) Prove or disprove:
For each prime number p,
the integer $p^2 + p - 1$ is prime.

(4) Prove or disprove:
For each positive integer n,
the integer $n^5 + 5n^2 - 6n$ is a multiple of 5.

(5) Prove or disprove:
Suppose that $\{x_n\}$ and $\{y_n\}$ are convergent sequences
of real numbers with $x_n < y_n$ for all n.
Then $\lim_{n\to\infty} x_n < \lim_{n\to\infty} y_n$.

(6) Prove or disprove:
The series

$$\sum_{n=1}^{\infty} \frac{2n+1}{n^4}$$

converges.