

MATH 201 FALL 2020 PRACTICE FINAL

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

- (1) Let A , B , and C be subsets of a set U . Prove or disprove:

$$(B \setminus A) \setminus (C \setminus A) = B \setminus C.$$

- (2) For a real number $x > -1$ and a positive integer n , prove that $(1 + x)^n \geq 1 + nx$.

- (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 $n^5 - n$ is a multiple of 5.

- (5) Prove or disprove:

If a sequence $\{x_n\}$ is divergent,
then one of its tails converges.

- (6) Show that the series

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

converges.