

MATH 201 FALL 2019 GRADED HOMEWORK #2

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

- (1) Consider the functions $f, g: \mathbb{R} \rightarrow \mathbb{R}$ defined by

$$f(x) = x^3 \quad \text{and} \quad g(x) = \sqrt{x^2 + 4}.$$

Find the formulas for $f \circ g$ and $g \circ f$.

- (2) Find the inverse of the function $f: \mathbb{R} \setminus \{-2\} \rightarrow \mathbb{R} \setminus \{3\}$ with

$$f(x) = \frac{3x + 5}{x + 2}.$$

- (3) Prove or disprove:

Proposition. For sets A and B , if $A \setminus B$ and A are countable, then B is countable.

- (4) Prove by induction: $\forall 4 < n \in \mathbb{N}, n + n^2 < 2^n$.