

## MATH 201 SPRING 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

$$f(x) = x^5 \quad \text{and} \quad g(x) = \sqrt[5]{x+1}.$$

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

- (2) Find the inverse of the function  $f: \mathbb{R} \setminus \{-2\} \rightarrow \mathbb{R} \setminus \{1\}$  with

$$f(x) = \frac{x+1}{x+2}.$$

- (3) Prove or disprove the following:

**Claim.** Suppose that  $A$  and  $B$  are uncountable sets. Then  $A \cap B$  is an uncountable set.

- (4) Prove, by induction, that  $n^2 + 3n < 2^n$  for all integers  $n$  bigger than 5.