

HOMEWORK 7

- 1) Hwk 8.16 (ignore the equivalence classes).
- 2) Let A be the set of all functions on \mathbb{R} . Define the relation R on A defined by $(f, g) \in R$ if $f(x) = g(x)$ for all $x \in \mathbb{Q}$. Prove R is an equivalence relation.
- 3) State whether or not each of the following is a function on \mathbb{R} . Explain why each answer.
 - a) $y = \sqrt{x - \pi}$
 - b) $y = \sqrt{x^2 - 1}$
 - c) $y = x^2 - 7$
 - d) $y^2 = x + 2$
- 4) State the (largest possible) domain and range of each of the following functions. (as subsets of \mathbb{R} .)
 - a) $f(x) = \frac{x^2 - 4}{x - 1}$
 - b) $f(x) = \sqrt{x^4 - 16}$
 - c) $f(x) = e^x$
- 5) Are the following functions injective and/or surjective (state yes or no for both)? (The domain and co-domain are given.)
 - a) $f : \mathbb{N} \rightarrow \mathbb{N}$ defined by $f(n) = 2n + 1$.
 - b) $f : \mathbb{Z} \rightarrow \mathbb{Z}$ defined by $f(n) = 2n + 7$.
 - c) $f : \mathbb{Z} \rightarrow \mathbb{Z}$ defined by $f(n) = n + 3$.
- 6) Prove the following functions are bijective.
 - a) $f : \mathbb{R} - \{1\} \rightarrow \mathbb{R} - \{\frac{1}{2}\}$ defined by $f(x) = \frac{x+1}{2x-1}$.
 - b) $f : \mathbb{R} - \{-2\} \rightarrow \mathbb{R} - \{3\}$ defined by $f(x) = \frac{3x-1}{x+2}$.
- 7) Prove the following functions are bijective.
 - a) $f : \mathbb{R}_{\geq 0} \rightarrow \mathbb{R}_{\geq 1}$ defined by $f(x) = x^2 + 1$.
 - b) $f : \mathbb{Q} \rightarrow \mathbb{Q}$ defined by $f(x) = 5x - 2$.
- 8) Hwk 9.40 parts $a - d$.