

Math 220 – Homework 9

Due Thursday 3/28 at the beginning of class

Total points: 148

(Writing portion 115 pts)

PART A

Problems from the textbook:

• Section 5.2	problem	1(a)	1(b)	2
	points	8	10	10

- Section 5.3 # 3(a,c)* [40 points]

PART B

- * [10 points] Let $f, g : \mathbb{R} \rightarrow \mathbb{R}$ are defined by $f(x) = 2x^2 - 1$ and $g(x) = 3x + 5$. Determine $(g \circ f)(1)$ and $(f \circ g)(1)$.
- * [10 points] Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = 3x - 2019$. Prove that $\text{ran} f = \mathbb{R}$.
- * [10 points] Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = 6x^6$ and $S = \{y \in \mathbb{R} \mid y \geq 0\}$. Prove that $\text{ran} f = S$.
- * [5 points] Let $f : [-1, \infty) \rightarrow \mathbb{R}$ be defined by $f(x) = \sqrt[4]{1+x}$ and $S = [0, \infty)$. Prove that $S \subseteq \text{ran} f$.
- Let $X = \{x \in \mathbb{R} \mid x \neq -5\}$ and $f : X \rightarrow \mathbb{R}$ be defined by $f(x) = \frac{3x-1}{x+5}$.
 - [5 points] Determine the range of f .
 - * [10 points] Prove that your answer for $\text{ran} f$ is correct.
- * [20 points] A function $f : \mathbb{Z} \rightarrow \mathbb{Z}$ is defined by $f(n) = 7n + 3$. Prove or disprove the following:
 - f is injective.
 - f is surjective.
- * [10 points] Determine whether the function $f : \mathbb{Z} \rightarrow \mathbb{Z}$ defined by $f(n) = \begin{cases} 2n, & \text{if } n \in \mathbb{E} \\ -n + 22, & \text{if } n \in \mathbb{O} \end{cases}$ is surjective. Give a formal proof of your answer.