

Math 300 – Homework 9

Total points: 0

PART A

Problems from the textbook:

- Section 5.3 # 1 (c), 3(a,c), 4, 6, 7(c).

PART B

1. A function $f : \mathbb{Z} \rightarrow \mathbb{Z}$ is defined by $f(n) = 7n + 3$. Prove or disprove the following:

- (a) f is injective.
- (b) f is surjective.

2. 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. If a function is surjective, give a formal proof, otherwise provide a counterexample.

3. Determine whether the following function is injection. If a function is injective, give a proof, otherwise provide a counterexample.

(a) $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = 16x^{16} - 14x^{14} - 2x^2 + 1$

(b) $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = x^3 + x^2$

(c) $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = -x^3 - x$

(d) $f : \mathbb{Z} \rightarrow \mathbb{Z}$ defined by $f(n) = \begin{cases} n + 2020, & \text{if } n \in \mathbb{E} \\ -n + 2020, & \text{if } n \in \mathbb{O} \end{cases}$