

Math 220 – Homework 8

Due Thursday 03/30 at the beginning of class

Total points=155

PART A

Problems from the textbook:

Section 2.2 # 15(a) 10pts, 17(a) 10pts, 23 10pts, 25(b) 10pts**Section 3.1** # 1 10pts, 2 10pts, 3(a,b,d,f) 20pts, 7 5pts**PART B**

1. Let A , B , and C be nonempty sets. Prove the following statements.
 - (a) 10pts $A \times (B \cap C) = (A \times B) \cap (A \times C)$.
 - (b) 10pts $(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$.
 - (c) 10pts If $A \subseteq B$, then $A \cup C \subseteq B \cup C$.
 - (d) 10pts $A \times (B - C) = (A \times B) - (A \times C)$. (Hint: $(x \in A) \wedge (y \notin B) \Rightarrow ((x, y) \notin A \times B)$)
2. 10pts Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = 2016 - 4x$. Prove that $Im f = \mathbb{R}$.
3. 10pts Let $f \in F(\mathbb{R})$ be defined by $f(x) = -x^{2n}$, where $n \in \mathbb{Z}^+$, and $S = \{y \in \mathbb{R} \mid y \leq 0\}$. Prove that $Im f = S$.
4. Let $f : \mathbb{Z} \rightarrow \mathbb{R}$ and let $g : \mathbb{Z} \rightarrow \mathbb{R}$ be defined by $f(n) = \cos(\pi n)$ and $g(n) = (-1)^n$.
 - (a) 5pts Find $Im(f)$ and $Im(g)$ and represent your answers using roster notation. (No formal proofs are necessary).
 - (b) 5pts Find graphs G_f and G_g and show that $G_f = G_g$.