

MAT 115: Finite Math for Computer Science

Problem Set 3

Due: 03/26/2018

Instructions:

I leave plenty of space on each page for your computation. If you need more sheet, please attach your work right behind the corresponding problem. If your answer is incorrect but you show the computation process, then partial credits will be given. Please staple your solution and use the space wisely. Each problem is worth 10 points while each bonus problem is worth 5 points.

First Name:

Last Name:

Group ID:

Score: /

Problem 1 GCD

Use the Euclidean Algorithm to find the GCD of the following:

(a) 1001 and 544

(b) 3510 and 652

Problem 2 GCD

Find **all common divisors** of 252 and 180 using the Euclidean algorithms

Problem 3 GCD and Linear Combination

Using the Euclidean algorithm, find A and B such that $Am + bn = \gcd(m, n)$ where $m = 163$, and $n = 86$.

Problem 4 Euler Function: pts

(a) Given $n = 162$, find $\phi(n)$

(b) Given $n = 210$, find $\phi(n)$

Problem 5 Set Partitions: pts

How many refinedments are there of the partition $\{\{1, 3, 5\}, \{2, 6\}, \{4, 7, 8, 9\}\}$? Explain.

Problem 6 Subset

Answer the following about \in and \subseteq operators.

(a) Is $\{1, 2\} \in \{\{1, 2\}, \{3, 4\}\}$?

(b) Is $\{2\} \in \{1, 2, 3, 4\}$?

(c) Is $\{3\} \in \{\{1, 2\}, \{3\}, \{4\}\}$?

(d) Is $\{1, 2\} \subseteq \{1, 2, \{1, 2\}, \{3, 4\}\}$?

(e) Is $1 \in \{\{1\}, \{2\}, \{3\}\}$?

Problem 7 Proof: Subset

(a) If A , B and C are subsets of U , then $A \subseteq B$ and $A \subseteq C$ implies that $A \subseteq (B \cap C)$

(b) If A , B and C are subsets of U , then $B \subseteq C$ and $A \subseteq C$ implies that $A \cup B \subseteq C$

Problem 8 Set Equality

Prove using the definition of set equality, that for all sets A, B, C that $(A - B) \cap (C - B) = (A \cap C) - B$

Problem 9 Set Order

Let $A = \{w, x, y, z\}$ and $B = \{a, b\}$. Take the linear order on A and B to be alphabetical order. Compute the following in lexicographic orders.

(a) $B \times A$

(b) $A \times A$

Problem 10 Set Algebraic Rules

(a) If A, B, C are subsets of U , then $(A - B) - C = (A - C) - B$

(b) If A, B, C are subsets of U , then $(A - B) - C = A - (B \cup C)$

Problem 11 Bonus Problem 1: 5pts

Using the Euclidean algorithm, find A and B such that $Am + bn = \gcd(m, n)$ where $m = 59400$, and $n = 16200$.

Problem 12 Bonus Problem 2

If A, B, C are subsets of U , then $(A - B) \cup (B - A) = (A \cup B) - (A \cap B)$

Problem 13 Bonus Problem 3

Here \mathbb{P} here stands for power set.

(a) Let $S = \{2, 3, 4, 5\}$ and what is $\mathbb{P}(S)$?

(b) $\mathbb{P}(A \cap B) = \mathbb{P}(A) \cap \mathbb{P}(B)$? True or false? And why?