CSE 211: Discrete Mathematics		(Due: 12/11/19)
Homework #2		
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Course Policy: Read all the instructions below carefully before you start working on the assignment, and before you make a submission.

- It is not a group homework. Do not share your answers to anyone in any circumstance. Any cheating means at least -100 for both sides.

- Do not take any information from Internet.

- No late homework will be accepted.

- For any questions about the homework, send an email to gizemsungu@gtu.edu.tr

- Submit your homework into Assignments/Homework1 directory of the CoCalc project CSE211-2019-2020.

Problem 1: Sets (2+2+2+2+2=10 points)

Which of the following sets are equal? Show your work step by step.

(a) $\{t : t$ is a root of $x^2 \ 6x + 8 = 0\}$

(b) $\{y : y$ is a real number in the closed interval $[2, 3]\}$

(c) $\{4, 2, 5, 4\}$

(d) $\{4, 5, 7, 2\}$ - $\{5, 7\}$

(e) $\{q:$ q is either the number of sides of a rectangle or the number of digits in any integer between 11 and 99$\}$
(Solution)

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Problem 2: Cartesian Product of Sets (15 points)

Explain why $(A \times B) \times (C \times D)$ and $A \times (B \times C) \times D$ are not the same.
(Solution)

Problem 3: Cartesian Product of Sets in Algorithms (25 points)

Let A, B and C be sets which have different cardinalities. Let (p, q, r) be each triple of $A \times B \times C$ where $p \in$ A, $q \in$ B and $r \in$ C. Design an algorithm which finds all the triples that are satisfying the criteria: $p \leq q$ and $q \geq r$. Write the pseudo code of the algorithm in your solution.

For example: Let the set A, B and C be as $A = \{ 3, 5, 7 \}$, $B = \{ 3, 6 \}$ and $C = \{ 4, 6, 9 \}$. Then the output should be : $\{ (3, 6, 4), (3, 6, 6), (5, 6, 4), (5, 6, 6) \}$.

(Note: Assume that you have sets of A, B, C as an input argument.)

(Solution)

Algorithm 1: Pseudo Code of Your Algorithm

  Input: The sets of A, B, C
  if *write a condition* **then**
   | Statements
  else
   | Statements
  end
  When you want to write a for loop, you can use:
   for *write a condition* **do**

  end
  When you want to write a while loop, you can use:
   while *write a condition* **do**
   | If you need to return, use **return**
  end
  For any additional things you have to do while writing your pseudo code, Google "How to use algorithm2e in Latex?".

Problem 4: Relations   (3+3+3+3+3+3+3=21 points)

Determine whether the relation R on the set of all integers is reflexive, symmetric, antisymmetric, and/or transitive, where $(x, y) \in R$ if and only if
(a) $x \neq y$.
(Solution)

(b) $xy \geq 1$.
(Solution)

(c) $x = y + 1$ or $x = y - 1$.
(Solution)

(d) x is a multiple of y.
(Solution)

(e) x and y are both negative or both nonnegative.
(Solution)

(f) $x \geq y^2$.
(Solution)

(g) $x = y^2$.
(Solution)

Problem 5: Functions   (15 points)

If f and f $\circ$ g are one-to-one, does it follow that g is one-to-one? Justify your answer.
(Solution)

Problem 6: Inverse of Functions   (7+7=14 points)

Let f be the function from $\mathbb{R}$ to $\mathbb{R}$ defined by $f(x) = x^2$. Find
(a) $f^{-1}(\{ x \mid 0 < x < 1 \})$
(Solution)

(b) $f^{-1}(\{ x \mid x > 4 \})$
(Solution)