Homework 5

1. Enumerate the elements of the following relations from the set A of positive integers less than or equal to 10 to the set B of positive integers less than or equal to 30. (20 points, 2 parts- 10 points each)
    a. An element a of A is related to the element b of B if $b = 3 \times a$
    b. An element a of A is related to the element b of B if $b = 2 \times a - 1$

2. Determine the inverse of the following relations: (20 points, 2 parts- 10 points each)

    a. The > relation defined on the integers
    b. The = relation defined on the integers

3. Let $A = \{0, 1, 2, 3\}$. Define a relation R on A as follows: (20 points)

    $R = \{(0, 0), ((1, 1), (2, 2), (1, 2), (2, 1), (2, 3), (3, 2)\}$.

    Draw a directed graph for this relation and identify which of the following properties hold for this relation:

    - Reflexive
    - Symmetric
    - Transitive
    - Antisymmetric

    Explain why it has a property or give a counterexample.

4. Given the set $A = \{1, 2, 3\}$ and the set $S = \{(x, y) \mid x \text{ and } y \text{ in } A\}$. Consider the relation $\leq$ defined on S as follows: $((x_1, y_1) \leq (x_2, y_2)$ if $x_1 \leq x_2$ and $y_1 \leq y_2$. Draw the directed graph of this relation. Show that it is a partial order. Explain why it is not a total order. (20 points)
5. Consider the set S defined in problem 4 and the following relation = defined on S as follows: $(x_1, y_1) = (x_2, y_2)$ if $x_1 + y_1 = x_2 + y_2$. Draw the directed graph of this relation. Show that it is an equivalence relation. List its equivalence classes. (20 points)

Grading Rubric:

Question	Meets	Does not Meet
Question 1	**20 points** Innovative and correct method of solution.	**0 points** Solution not described, or not correct.

	Calculations and supporting evidence are complete and correct for the problem. Solution is neat, well-organized and well-written.	Calculations and supporting evidence are incorrect or not present. Solution is unorganized and poorly written.
Question 2	**20 points** Innovative and correct method of solution. Calculations and supporting evidence are complete and correct for the problem. Solution is neat, well-organized and well-written.	**0 points** Solution not described, or not correct. Calculations and supporting evidence are incorrect or not present. Solution is unorganized and poorly written.
Question 3	**20 points** Innovative and correct method of solution. Calculations and supporting evidence are complete and correct for the problem. Solution is neat, well-organized and well-written.	**0 points** Solution not described, or not correct. Calculations and supporting evidence are incorrect or not present. Solution is unorganized and poorly written.
Question 4	**20 points** Innovative and correct method of solution. Calculations and supporting evidence are complete and correct for the problem. Solution is neat, well-organized and well-written.	**0 points** Solution not described, or not correct. Calculations and supporting evidence are incorrect or not present. Solution is unorganized and poorly written.
Question 5	**20 points** Innovative and correct method of solution. Calculations and supporting evidence are complete and correct for the problem. Solution is neat, well-organized and well-written.	**0 points** Solution not described, or not correct. Calculations and supporting evidence are incorrect or not present. Solution is unorganized and poorly written.