	SCORE
1. Let $A = \{1, 2, 3, 4\}, B = \{2, 4, 6, 8, 9\}$. Find the following:	
(a) $A \cup B$	[3 points]
(b) $A \cap B$	[3 points]
(c) $(A \cap B) \times A$	[3 points]
(d) $A \oplus B$	[3 points]
 Define each of the following using set builder notation: (a) Union 	[3 points]
(b) Intersection	

[3 points]

(c) Set Difference

[3 points]

3. Let the universal set $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ and $A = \{0, 1, 2, 3, 4\}$, $B = \{1, 3, 5, 7, 9\}$, $C = \{2, 4, 6, 8, 10\}$. Find the following:



4. Show that $A\cap (B\cup C)=(A\cap B)\cup (A\cap C)$ by (1) using a truth table and (2) with element chasing.

[8 points]

5. Show $Y \cap (X \cup Y) = Y$ using:

(a) venn diagrams

[6 points]

(b) element chasing

[6 points]

6. Define each of the following properties of a relation:

(a) reflexive	[3 points]
(b) antisymmetric	[3 points]
(c) symmetric	[3 points]
(d) transitive	

[3 points]

7. Let $A = \{1, 2, 3, 4\}$, identify the following relations as reflexive, irreflexive, symmetric, antisymmetric, and/or transitive:

(a)
$$R = \{(1,1), (1,2), (2,1), (2,2), (2,3), (3,2), (3,3), (4,4)\}$$
 [3 points]

(b) $R = \{(1,1), (2,2), (4,3), (1,2)\}$

[3 points]

8. Let $A = \{0, 1, 2, 3\}$, and $B = \{0, 1, 2, 3, 4, 5\}$, Determine which of the following relations are functions, and why. If the relation is a function, determine if it is an injection (one-to-one), surjection (onto), or bijection (both).

(a)
$$R = \{(0,0), (1,1), (2,2), (3,3), (2,4), (1,5)\}$$
 [3 points]

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

[3 points]

(c) $R = \{(0,0), (1,5), (2,2), (3,4)\}$

[3 points]

9. If $f \circ g$ is one-to-one, must g be one-to-one? If so, explain why. If not, give a counterexample.

[6 points]

10. Determine if the following relation is an equivalence relation on $A = \{a, b, c, d, e, f\}$. If it it is, list its equivalence classes, if it isn't, explain why it isn't.

$$R = \{(a, a), (a, b), (b, b), (b, a), (c, c), (c, d), (c, e), (d, d), (d, c), (d, e), (e, e), (e, c), (e, d), (f, f)\}$$
[6 points]