In case anybody does both grad and undergrad for number 4, grads earn 3 extra points and undergrads earn 5 extra points.

1. (6 points) What is the power set of {a, b, c, d} ?

$\{\{\}, \{a\}, \{b\}, \{c\}, \{d\}, \{a,b\}, \{a,c\}, \{a,d\}, \{b,c\}, \{b,d\}, \{c,d\}, \{a,b,c\}, \{a,b,d\}, \{a,c,d\}, \{b,c,d\}, \{a,b,c,d\}\}$

Note: a fast check is for 16 items. If there aren't 16 it's wrong.

2. (6 points) Suppose $A \subset B$. Show that $2^A \subset 2^B$.

$A \subset B \therefore 2^A \subset A$

$2^B \subset B \therefore 2^A \subset 2^B$

The elements of 2^A and 2^B are elements of A and B respectively. If the elements of A are a subset of B, then the same applies to 2^A and 2^B

3. (6 points) Let A = {2,4,6,8,10,12}, B = {1,3,6,9,12} and then Ω = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}
What are:

What are each of the following:

- $\Omega \setminus (A \cup B)$ $(A \cup B) = \{1,2,3,4,6,8,9,10,12\}$

  $\Omega \setminus (A \cup B) = \{5, 7, 11\}$
- $A \cap B = \{6, 12\}$
- $A \cup B = \{1, 2, 4, 6, 8, 9, 10, 12\}$

4. (7 points)

   – Undergrad: Show $A^C \cap B^C = (A \cup B)^C$

   ~~– Grad: Show $A^C = (A^C \cap B) \cup (A^C \cap B^C)$~~

$A^C \cap B^C = \{x : x \notin A \text{ and } x \notin B\}$

$(A \cap B)^C = \{x : x \notin (A \cap B)\} = \{x : x \notin A \text{ or } x \notin B\}$

$\{x : x \notin A \text{ and } x \notin B\} = \{x : x \notin A \text{ or } x \notin B\}$

(De morgan's Laws)