1) $\{x : x = x\}$: all elements in the domain

$\{x : x \neq x\}$: $\{\emptyset\}$

2) When $A = B$
or A is an empty set
or B is an empty set

3) a) No, the non-passing grades have no students and it requires at one studundet for each grade. However, it does not clear state that there is at least one student for each grade.

b) No, his brother did not take the exam. Since he is not in of the domain therefore it does not form a partition

4) a) False, $\mathbb{Z} \times \mathbb{Z}$ contains zero which is not in the domain of $\mathbb{Z}^+ \times \mathbb{Z}^-$

b) True, they are pairwise disjoint if $(\mathbb{Z}^+ \times \mathbb{Z}^-) \cup (\mathbb{Z}^- \times \mathbb{Z}^+)$

c) True, It is identical to the domain $(\mathbb{Z}^+ \times \mathbb{Z}^-) \cup (\mathbb{Z}^- \times \mathbb{Z}^+)$

d) False, $\mathbb{Z}^+ \times \mathbb{Z}^+$ and $\mathbb{Z}^- \times \mathbb{Z}^-$ contain positive integers only.

5) a) True. Empty set is an element of an empty set

b) False. No set can be a proper subset of itself.

c) True. a is an element of $\{a, \{a\}\}$.

d) True. The only element in the power set of an empty set is an elempty set.

6) $(A \cup B) - (A \cap B) - C$

$\equiv (A \oplus B) - C$