Name: ______________________________ **PanthID:** ______________________

Quiz 2-B MAD 2104 Summer A 2015

1. (6 pts) For each of the following, circle the correct answer. Only one answer is correct. No proof or justification necessary, but a Venn diagram may help you.

(a) For any sets S, T, if $S \subseteq T$ then:

(i) $\overline{S} \subseteq \overline{T}$ (ii) $S \cap T = \emptyset$ (iii) $S - T = \emptyset$ (iv) $S \cap T = S \cup T$

(b) According to DeMorgan's laws $\overline{A \cap (B \cup C)} =$

(i) $\overline{A} \cap (\overline{B} \cup \overline{C})$ (ii) $\overline{A} \cup (\overline{B} \cap \overline{C})$ (iii) $\overline{A} \cup (B \cup C)$ (iv) $A \cup (B \cap C)$

(c) Which of the following is true for all sets A and B?

(i) $A \cap \overline{B} = \overline{A \cap B}$ (ii) $A \cap \overline{B} = A - (A \cap B)$ (iii) $(A \cup B) - B = A$ (iv) $A \cup B = A \cap B$

2. (7 pts) The symmetric difference of two sets A, B is denoted by $A \oplus B$ and is defined sometimes by $(A - B) \cup (B - A)$ and sometimes by $(A \cup B) - (A \cap B)$.

(a) (6 pts) Show that for any sets A and B, $(A - B) \cup (B - A) = (A \cup B) - (A \cap B)$.

(b) (1 pts) To what logical connector does the set operation $A \oplus B$ correspond to?

3. (8 pts) For each of the following, circle **all** the true statements. More than one, or none, of the answers could be true. No proof or justification necessary.

(a) Let $A = \{1, 2, 3, 4\}$ and let $\mathcal{P}(A)$ be the power set of A. From the statements below, circle the ones which are true:

(i) $\{2, 4\} \in \mathcal{P}(A)$ (ii) $\{\{2\}, \{4\}\} \subseteq \mathcal{P}(A)$ (iii) $\{1, 3\} \subseteq \mathcal{P}(A)$ (iv) $1 \in \mathcal{P}(A)$

(b) On the set of all people, let $\mathcal{R}$ be the relation given by $(a, b) \in \mathcal{R}$ if and only if a and b have the same birthday (day and month). From the statements below, circle the ones which are true:

(i) $\mathcal{R}$ is reflexive (ii) $\mathcal{R}$ is symmetric (iii) $\mathcal{R}$ is anti-symmetric (iv) $\mathcal{R}$ is transitive

4. (6 pts) If possible, give an example of a relation $\mathcal{R}$ on the set $A = \{a, b, c\}$ which is symmetric, transitive, but not reflexive and not anti-symmetric. If not possible, explain why.