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## QUIZ 25

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1. For languages  $A$  and  $B$ , recall that  $A \setminus B = \{w \in A \mid w \notin B\}$ . If  $A$  and  $B$  are decidable, which of the following are necessarily true?

- (A)  $A \setminus B$  is context-free
- (B)  $A \setminus B$  is decidable but may not be context-free.
- (C)  $A \setminus B$  is recursively enumerable but may not be decidable.
- (D)  $A \setminus B$  may not be recursively enumerable.

Correct answer is (B).

2. For a language  $L$ , recall that  $\text{PREFIX}(L) = \{u \mid \exists v. uv \in L\}$ . If  $L$  is decidable, which of the following is necessarily true?

- (A)  $\text{PREFIX}(L)$  is context-free
- (B)  $\text{PREFIX}(L)$  is decidable but may not be context-free.
- (C)  $\text{PREFIX}(L)$  is recursively enumerable but may not be decidable.
- (D)  $\text{PREFIX}(L)$  may not be recursively enumerable.

Correct answer is (C).

3. Let  $A$  be a language and  $\overline{A}$  be its complement. Which of the following is the strongest statement that is necessarily true?

- (A) Both  $A$  and  $\overline{A}$  are recursively enumerable.
- (B) At least one among  $A$  and  $\overline{A}$  is recursively enumerable.
- (C)  $A$  is recursively enumerable if and only if  $\overline{A}$  is recursively enumerable.
- (D) It is possible that neither  $A$  nor  $\overline{A}$  is recursively enumerable.

Correct answer is (D).

4. Let  $A$  and  $B$  be languages. Which of the following is the strongest statement that is necessarily true?

- (A)  $A \cup B$  is decidable if and only if  $A$  and  $B$  are decidable.
- (B) If  $A \cup B$  is decidable then  $A$  and  $B$  are decidable.
- (C) If  $A$  and  $B$  are decidable then  $A \cup B$  is decidable.
- (D) If either  $A$  or  $B$  is not decidable then  $A \cup B$  is not decidable.

Correct answer is (C).