Algorithm question: (NP question)

Answer True or False for the following statements and also justify your reasons.

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1. If an NP-complete problem can be reduced to a problem L in polynomial time, then L is NP-complete.

Ans. False, L 是 NP-hard

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2. If a problem A can be reduced to a problem B and $A \in P$, then $B \in P$.

Ans. False, 要多加一項 polynomial-time reduced 的條件。

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3. If a problem $A \in P$, then $A \in NP$.

Ans. True, $P \subseteq NP$

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4. If $P \neq NP$, there exists a 2-approximation algorithm for the general traveling-salesman problem.

Ans. False, 定理：若 $P \neq NP$，則不存在 ρ-approximation algorithm 去解 general TSP, $\forall \rho (\rho \geq 1)$

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5. The maximum numbers of elements in a heap of heigh h is $2^h - 1$

Ans. True, fully-binary tree.