

Worth: 2%**Due:** By 9:59pm on Monday 17 November**Remember to write your *full name* and *student number* prominently on your submission.**

Please read and understand the policy on Collaboration given on the Course Information Sheet. Then, to protect yourself, list on the front of your submission **every** source of information you used to complete this homework (other than your own lecture and tutorial notes, and materials available directly on the course webpage). For example, indicate clearly the **name** of every student with whom you had discussions, the **title** of every additional textbook you consulted, the **source** of every additional web document you used, etc.

For each question, please write up detailed answers carefully. Make sure that you use notation and terminology correctly, and that you explain and justify what you are doing. Marks **will** be deducted for incorrect or ambiguous use of notation and terminology, and for making incorrect, unjustified, ambiguous, or vague claims in your solutions.

Consider the following problems.

Traveling Salesman *Decision* Problem (TSDP):

Input: Bound $B \in \mathbb{Z}$ and directed graph G with edge weights $w(e) \in \mathbb{Z}$.

Output: Is there a Hamiltonian cycle in G with total weight at most B ?

Traveling Salesman *Optimization* Problem (TSOP):

Input: Directed graph G with edge weights $w(e) \in \mathbb{Z}$.

Output: A Hamiltonian cycle in G with the smallest possible total weight.

Show that $\text{TSOP} \xrightarrow{p} \text{TSDP}$ (in other words, that the Traveling Salesman Problem is polynomial-time self-reducible). Write your solution carefully, following the format presented in class.