

- This homework set has *three* questions, each one with increasing difficulty. You must work in pairs to determine the solutions.
- Every member of the team must be able to explain how you arrived at the answer.
- You may be asked to present your answer on the blackboard.

1. Given $k \geq 1$, show that a graph has a k -flow if and only if each of its blocks has a k -flow.
2. Let H be a finite abelian group, G a graph and T a spanning tree of G . Show that every mapping from the directions of $E(G) \setminus E(T)$ to H that satisfies $f(x, y) = -f(y, x) \forall e \in E(G) \setminus E(T)$ extends uniquely to an H -circulation on G .
3. Show that every graph with an Hamilton cycle has a 4-flow.