# Kevin Martin

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To reduce Hamiltonian path to Hamiltonian cycle in graph G, first add a new node x that only touches the starting node s of the Hamiltonian path to the end node t to create G’ . By doing so, we can assume the following:

1. The conversion to add node x is in polynomial time
2. We can recover our solution in polynomial time as well (by removing x)
3. If we find a HC in G’, that will give us a HP. If there is a HC in G’, in must include node x, because x only has two neighbors s and t
4. If there is a HP, does the algorithm find it? Yes, because if there is a HP in G, and we add x, then G’ will be a HC