

## 1 Understanding Reductions (inspired by Sedgewick and Wayne)

Suppose problem X can be reduced to problem Y in polynomial time. For the following, indicate if the statement is true or *explain why* it is false.

1. If Y is NP-hard then so is X.
2. If X is NP-hard then so is Y.
3. If Y is NP-complete then so is X.
4. If X is NP-complete then so is Y.
5. If Y is in P then so is X.
6. If X is in P then so is Y.

## 2 Complexity Hierarchy (inspired by Sedgewick and Wayne)

Suppose  $P \neq NP$ . For the following, indicate if the statement is true or *explain why* it is false.

1. If X is NP-complete, then X cannot be solved in polynomial time.
2. If X is in NP, then X cannot be solved in polynomial time.
3. If X is in NP, then X is not NP-hard.
4. If X is in P, then X is not NP-complete.

## 3 Reduction

Do problem 8.3 from Dasgupta et al.

## 4 Reduction

Do problem 8.9 from Dasgupta et al.

## 5 Reduction

Reduce 3D Matching to SAT.