

## Metaheuristic Optimization

### Lab 2: NP-Completeness

1. This problem concerns the proof of the NP-completeness of 3-SAT

a) Convert the formula

$$F = (x \vee p) \wedge (-x \vee y \vee z \vee -p) \wedge (-y \vee q \vee -z)$$

into a 3SAT formula, using the construction/reduction

b) Find a solution for the 3SAT instance of  $F$  and verify that it is a solution for the original problem.

Note a solution is an assignment of a value (True or False) to EVERY VARIABLE, including any additional variables added in the 3SAT case (but you do not need to give the value for each literal, just each variable).

2. This problem concerns the proof of the NP-completeness of 3COL

a) Convert the 3SAT formula

$$F = (x \vee p \vee -y) \wedge (-x \vee y \vee z) \wedge (-y \vee q \vee -z)$$

into a 3COL graph.

b) Find a solution for the 3COL instance of  $F$  and verify that it is a solution for the original problem.

Note a solution is an assignment of a color (T/F/Y) to every vertex added in the 3COL graph.