

## Solution to Homework 28

**Problem.** On the example of the formula  $(a \vee b \vee \neg c) \& (a \vee \neg b)$ , show how checking its satisfiability can be reduced to an instance of the clique problem.

**Solution.** According to the general algorithm, since we have 2 clauses, we will be looking for cliques of size 2, i.e., edges.

To construct the corresponding graph, we do the following. First, we place two groups of vertices:

- vertices  $a_1$ ,  $b_1$ , and  $\neg c_1$  corresponding to the first clause; and
- vertices  $a_2$  and  $\neg b_2$  corresponding to the second clause.

The following pairs of vertices are connected by edges:

- the vertex  $a_1$  is connected to  $a_2$  and  $\neg b_2$ ;
- the vertex  $b_1$  is connected to  $a_2$  (but *not* to  $\neg b_2$ ); and
- the vertex  $\neg c_1$  is connected to  $a_2$  and to  $\neg b_2$ .

These edges are the desired cliques of size 2.