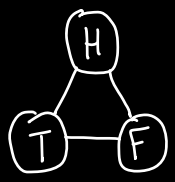
Algo HW 10

AJ Pai

Recreate constraints of the original problem to the context of this problem.

we need 3 SAT and 3 gadgets:

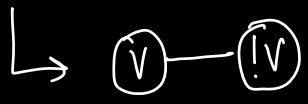


H = head

T = true

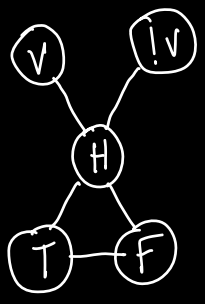
F = False

for each variable, we need to make 2 vertacies and connect them



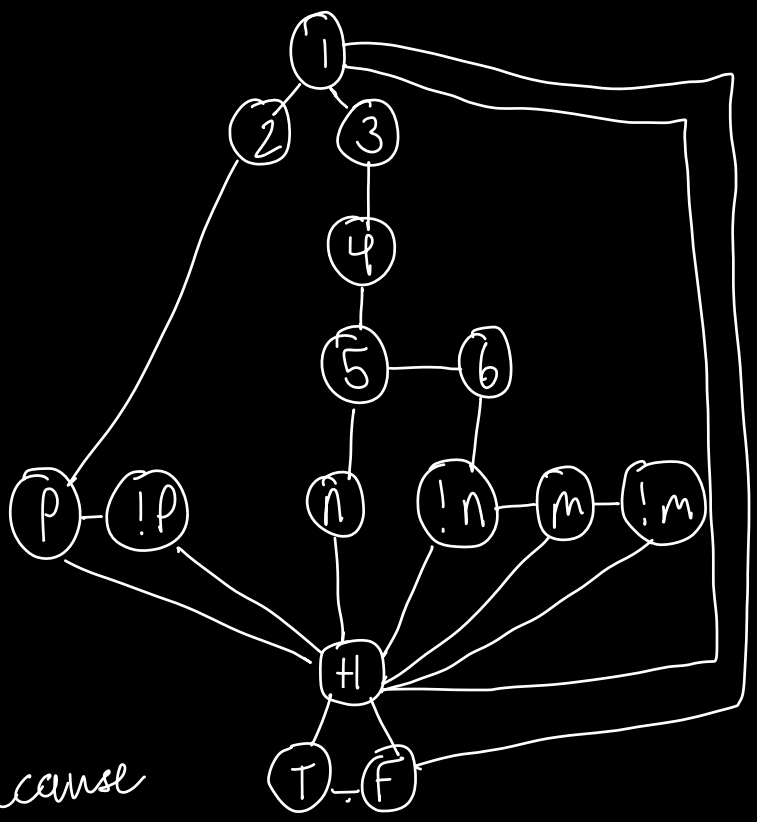
Since the color can not be the same, if v is true, !v has to be false.

The head can still be colored so if we add it to the clique:



The gadget needs to check if there are 3 variables, one of them has to be true. Lets look at v and n, if both are false, their neighbors have to be either the head or false.

Final construction:



1 must be true, meaning 2 and 3 must be false or head. P is false so 2 must be head and 3 is false. If n and m are false, then 5 and 6 must be True. This means 4 is False.

This is a **contradiction** because 3 and 4 can not both be false. This means this method is uncolorable. To make this colorable, one of the 3 inputs have to be true.

If we let P be true then 3 can be false and 2 can be head and 1 can be true.

Clauses:

$m \neq \overline{m}$ bc of gadget

$m \in \{T, F\}$

$\overline{m} \in \{T, F\}$

$\overline{m}$ to head

For each clause at least one variable is true. This means if a satisfying assignment exists then a 3 color graph is possible.