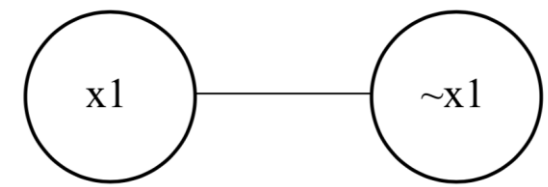
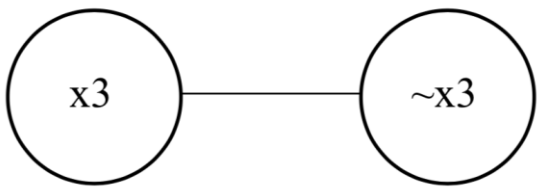
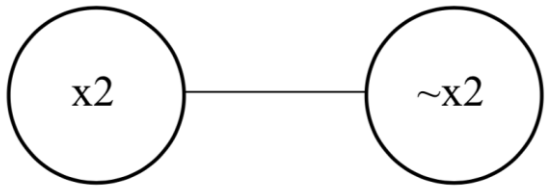
Assignment 6 key

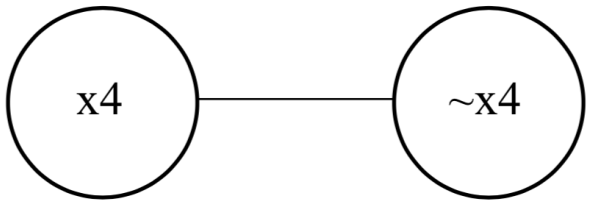
1. Consider the 3SAT instance:
E = (x1 ∨ ¬x2 ∨ ¬x3) & (¬x1 ∨ x2 ∨ x3) & (x1 ∨ ¬x4 ∨ ¬x4) & (x3 ∨ x3 ∨ x3)
a. Recast **E** as an instance of k-Vertex Covering and present a solution to the latter.

ANS: We are going to construct the following gadgets for the variables*:









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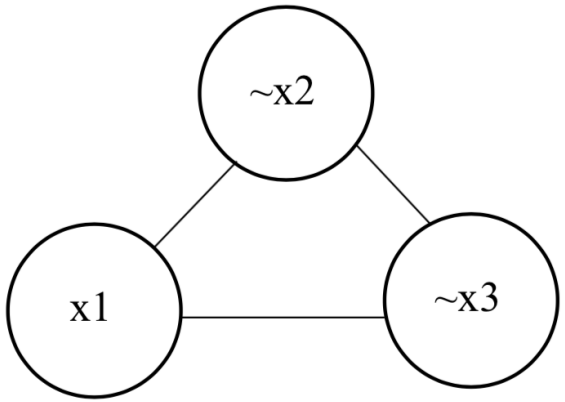
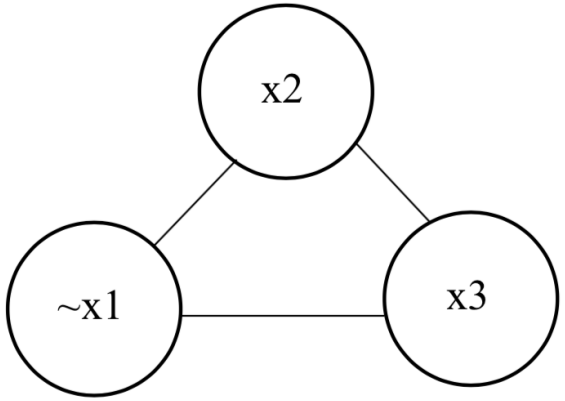
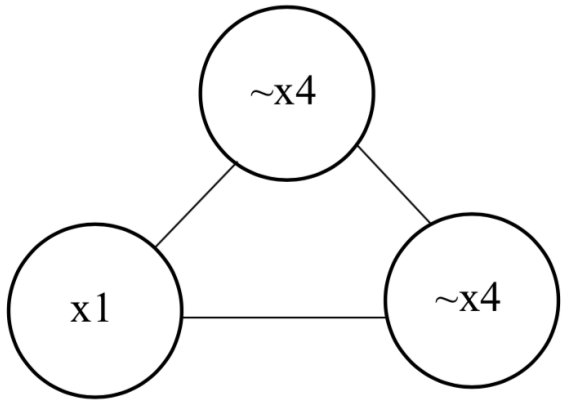
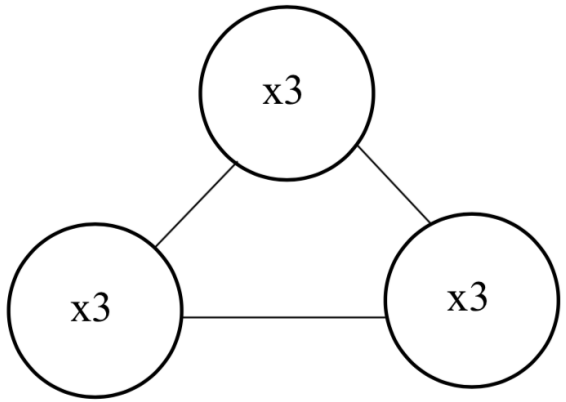
We need to construct the clause gadgets for each clause*:









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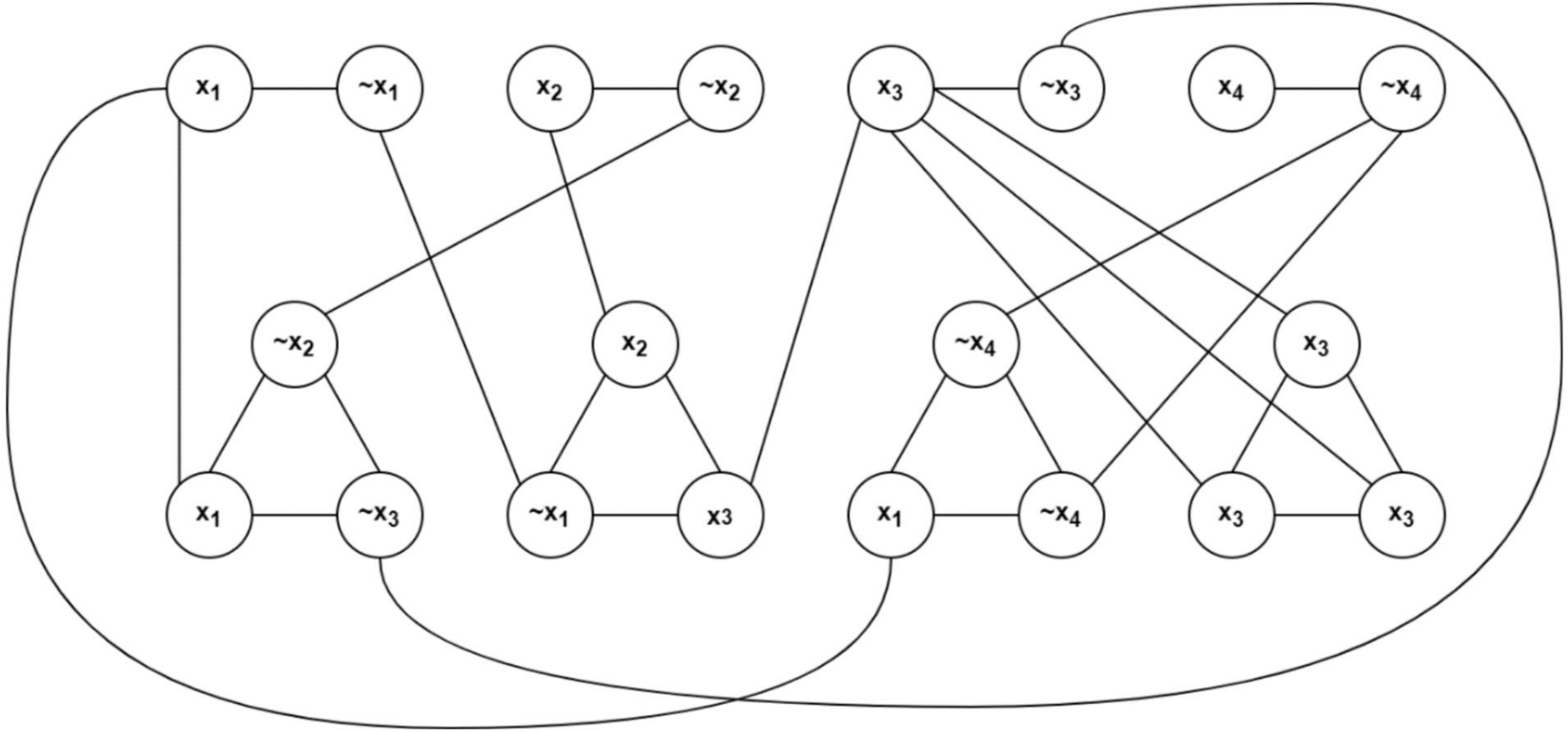
Combined gadgets:



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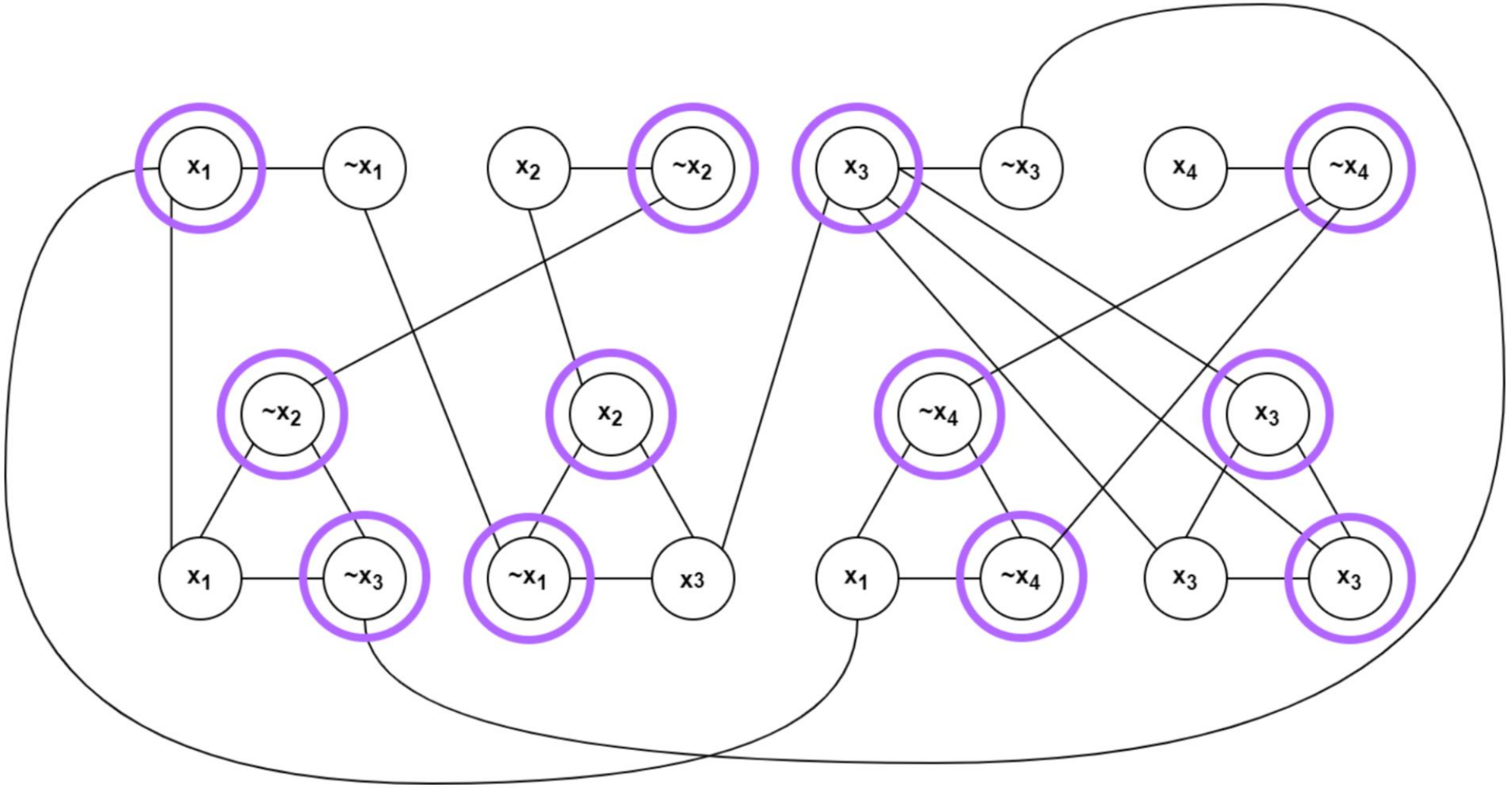
Selecting the Vertex Cover:



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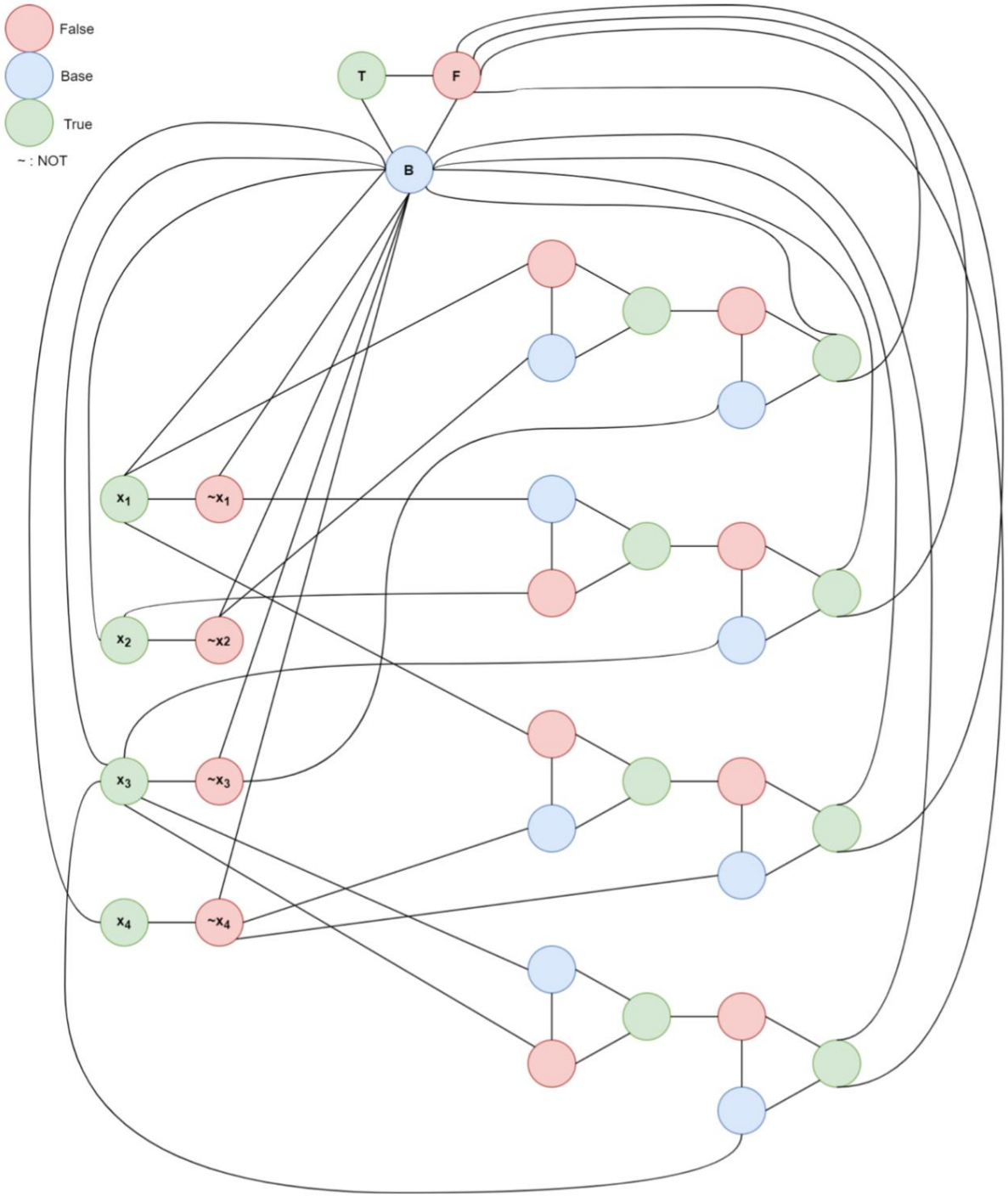
b. Recast E as an instance of 3-Coloring and present a solution to the latter

ANS: We define the colored gadget at the top of the graph with three nodes, false, true and base. By combining this new gadget to the 3-sat clauses we get the following :



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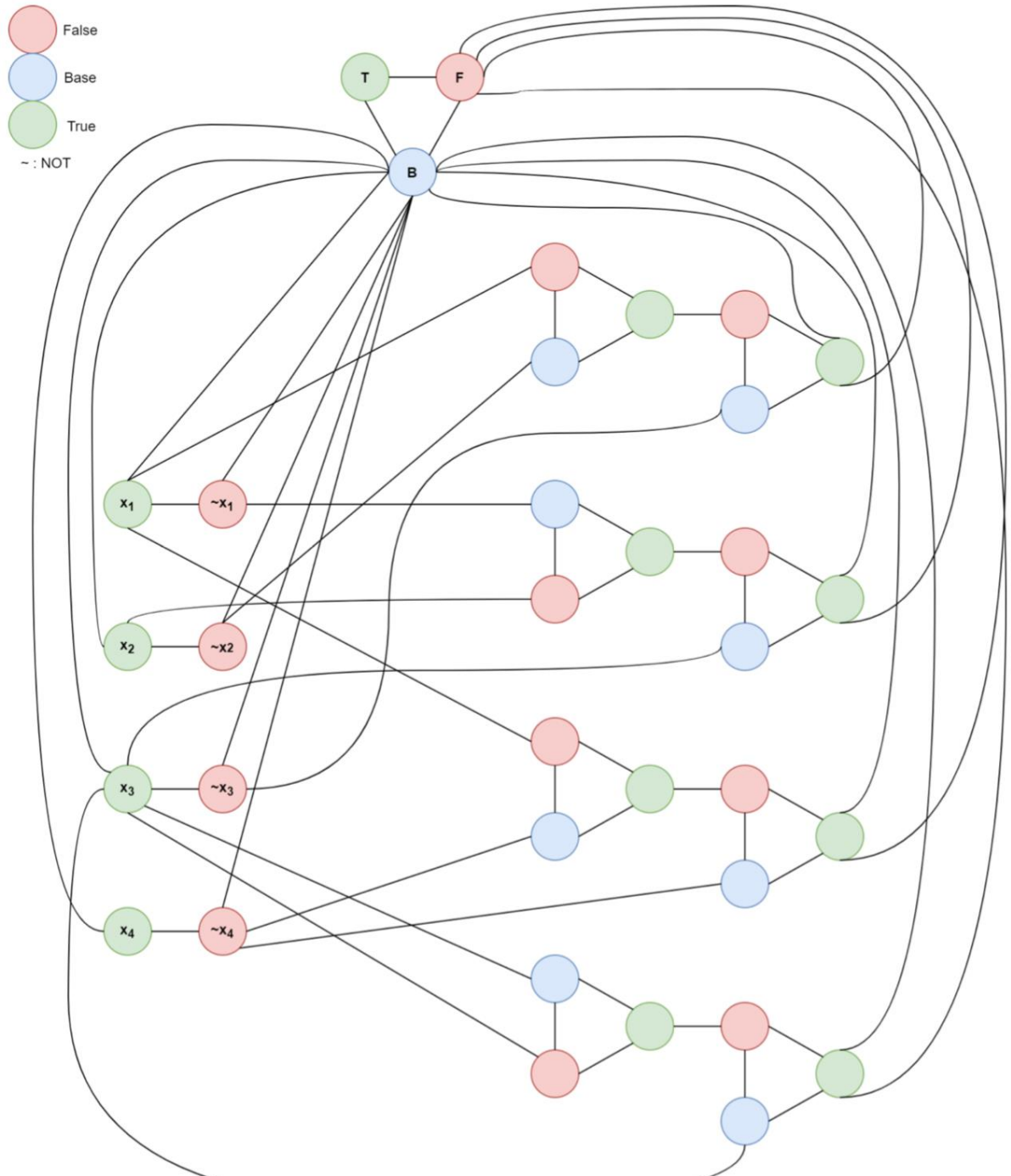
Consider a 3-SAT instance x1 = T, x2 = T, x3 = T, x4 = T which satisfies all clauses. Clearly we can 3-color the graph as follows:



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2. Consider the task list
(T1,8), (T2,5), (T3,2), (T4,7), (T5,1), (T6,2), (T7,6)
Fill in the schedules for these tasks under the associated strategies below.

a. Greedy using the list order above:

ANS:

T1	T1	T1	T1	T1	T1	T1	T1	T5	T6	T6	T7	T7	T7	T7	T7	T7
T2	T2	T2	T2	T2	T3	T3	T4	T4	T4	T4	T4	T4	T4			

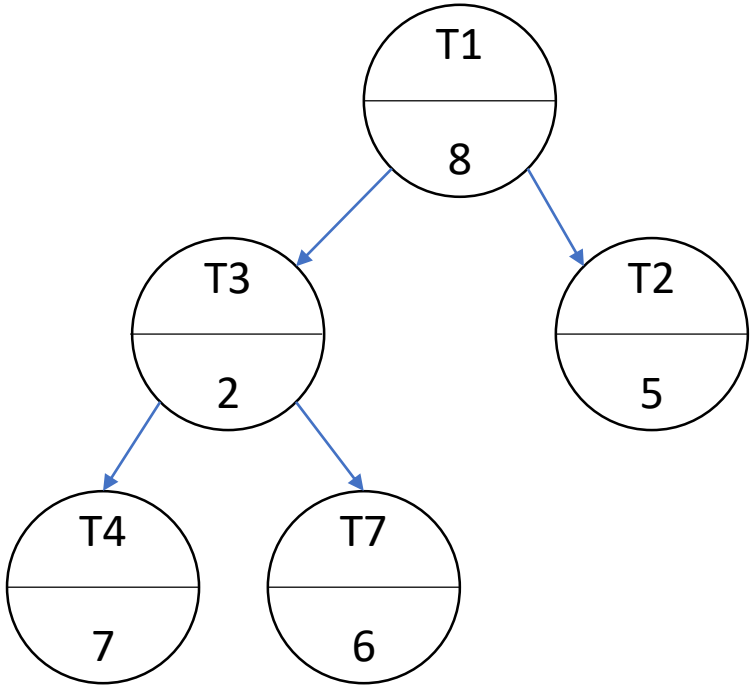
b. Greedy using a reordering of the list so that longest-running tasks appear earliest in the list (I did the sorting for you):
(T1,8),: (T4,7), (T7,6), (T2,5), (T3,2), (T6,2), (T5,1)

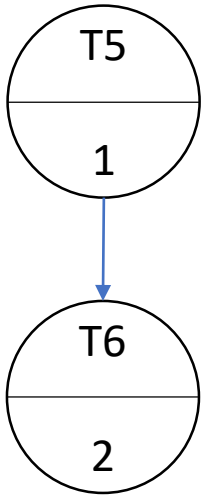
ANS:

T1	T1	T1	T1	T1	T1	T1	T1	T2	T2	T2	T2	T2	T3	T3	T5	
T4	T4	T4	T4	T4	T4	T4	T7	T7	T7	T7	T7	T7	T6	T6		

3.What if in the above case (T1,8), (T2,5), (T3,2), (T4,7), (T5,1), (T6,2), (T7,6), we had that there is a partial order T1<T2; T1<T3; T3<T4; T3<T7; T5<T6?

a. Draw the graph that depicts these relationships.





b. Show the 2-processor schedule that results when the task number is the priority; smaller task number means higher priority.

T1	T1	T1	T1	T1	T1	T1	T1	T2	T2	T2	T2	T2	T7	T7	T7	T7	T7	T7
T5	T6	T6						T3	T3	T4	T4	T4	T4	T4	T4	T4		