SAT Worksheet

$$(x1 \vee x2 \vee x4 \vee x7) \wedge (x3 \vee x5) \wedge (x2 \vee x3 \vee x4 \vee x6 \vee x8)$$

Find a satisfying truth assignment for the SAT instance above.

$$(\bar{x}_1 \vee T x_4 \vee \overline{x_7}) \wedge (F \cap \bar{F}) \wedge (\overline{x_2} \vee \bar{F} \vee x_4 \vee \bar{x}_6 \vee x_8)$$

$$T \wedge (F \wedge T) \wedge (\bar{x}_2 \vee T \vee x_4 \vee \bar{x}_6 \vee x_8)$$

$$T \wedge T \wedge T$$

$$T$$

Reduce the SAT instance above to a 3SAT instance using the method described in class.

$$\{\overline{x_1}, x_2, x_4, \overline{x_7}\} \rightarrow \{\overline{x_1}, x_2, \overline{v_1}\}, \{v_1, x_4, \overline{x_7}\}$$

$$\{x_3, \overline{x_5}\} \rightarrow \{x_3, \overline{x_5}, v_2\}, \{x_3, \overline{x_5}, \overline{v_2}\}$$

$$\{\overline{x_2}, \overline{x_3}, x_4, \overline{x_6}, x_8\} \rightarrow \{\overline{x_2}, \overline{x_3}, \overline{v_3}\}, \{v_3, x_4, \overline{v_4}\}, \{v_4, \overline{x_6}, x_8\}$$

Find a satisfying truth assignment for the 3SAT instance.

$$(\bar{x}_1 \vee x_2 \vee \overline{v_1}) \wedge (v_1 \vee x_4 \vee \overline{x_7}) \wedge (x_3 \vee \overline{x_5} \vee v_2) \wedge (x_3 \vee \overline{x_5} \vee \overline{v_2}) \wedge (\bar{x}_2 \vee \bar{x}_3 \vee \overline{v_3}) \wedge (v_3 \vee x_4 \vee \overline{v_4}) \wedge (v_4 \vee \bar{x}_6 \vee x_8)$$

$$(\bar{x}_1 \vee T \vee \overline{v_1}) \wedge (T \vee x_4 \vee \overline{x_7}) \wedge (F \vee T \vee v_2) \wedge (F \vee T \vee \overline{v_2}) \wedge (F \vee T \vee F) \wedge (T \vee x_4 \vee F) \wedge (T \vee \bar{x}_6 \vee x_8)$$

$$T \wedge T \wedge T \wedge T \wedge T \wedge T \wedge T \equiv T$$

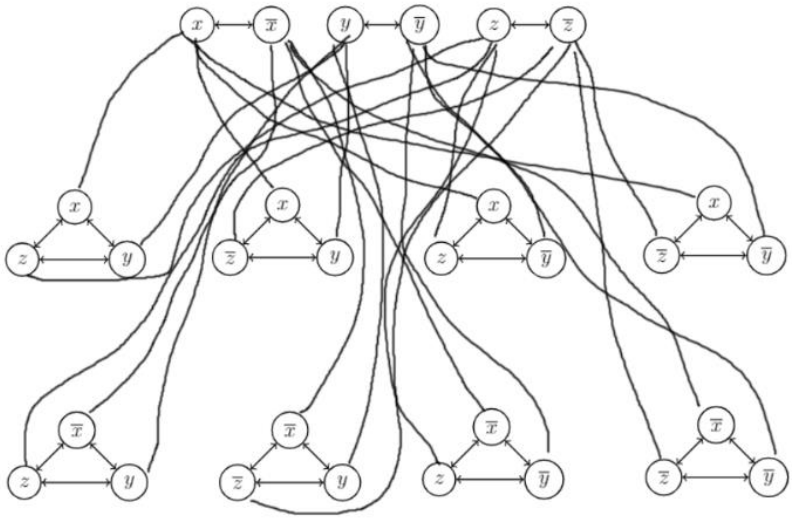
In your own time: repeat for SAT instance that is not satisfiable.

Vertex Cover is NPC Worksheet

$$(x \vee y \vee z) \wedge (x \vee y \vee z) \wedge (x \vee y \vee z) \wedge (x \vee y \vee z) \wedge (x \vee y \vee z) \wedge (x \vee y \vee z) \wedge (x \vee y \vee z) \wedge (x \vee y \vee z)$$

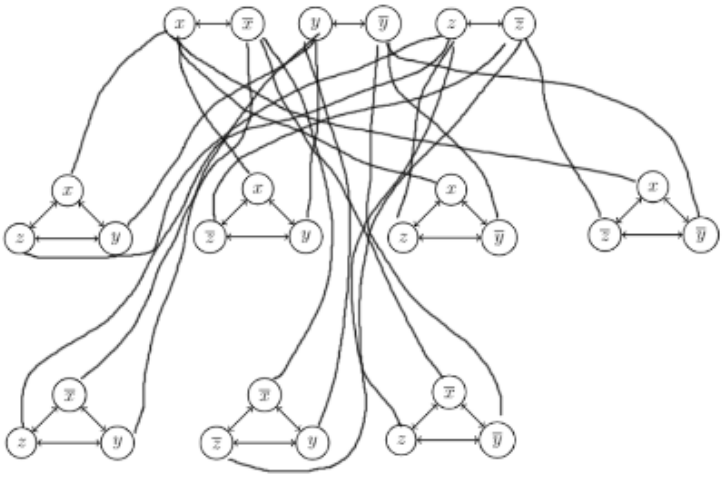
Is there a satisfying truth assignment for the 3-SAT instance above with N = 3 variables and C = 8 clauses?

Reduce the 3-SAT instance above to a VC instance using the method described in class and draw the resulting graph. Is there a vertex cover of size N + 2C = 19?



There is no vertex cover of size N + 2C = 19 since the original expression is not satisfiable.

Modify the 3-SAT instance by deleting the last clause (so that C becomes 7) and repeat the process above.



There is no vertex cover of size N + 2C = 17 since the original expression is not satisfiable.