#SAT

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Instance: A propositional formula **F** in CNF

Problem: Count the satisfying assignments of **F**

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#SAT is **#P**-complete

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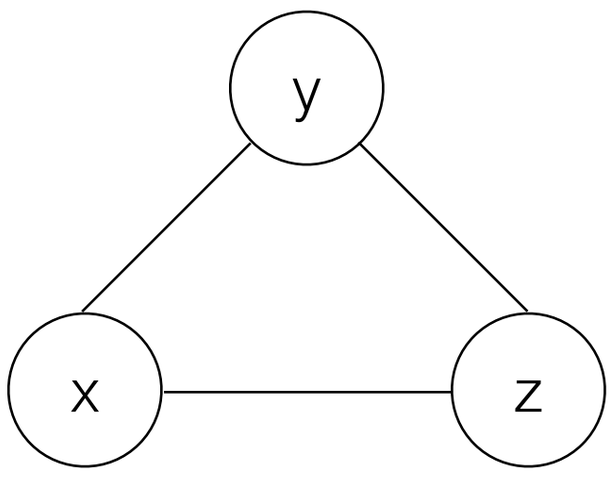
#SAT is **#P**-complete

Applications in Probabilistic Reasoning

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

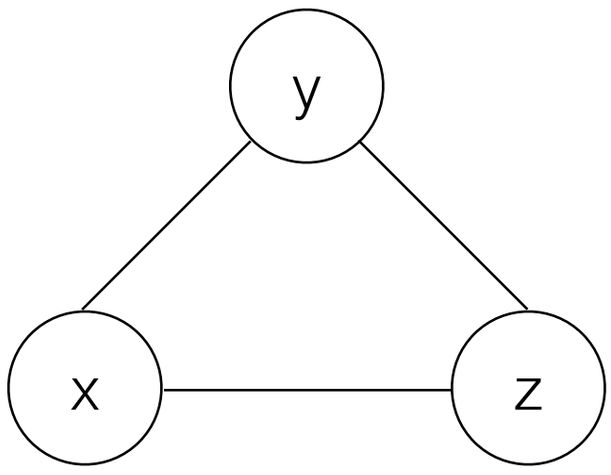
$$(x \vee \neg y \vee z) \wedge (\neg x \vee \neg z) \wedge (y \vee z)$$

primal graph

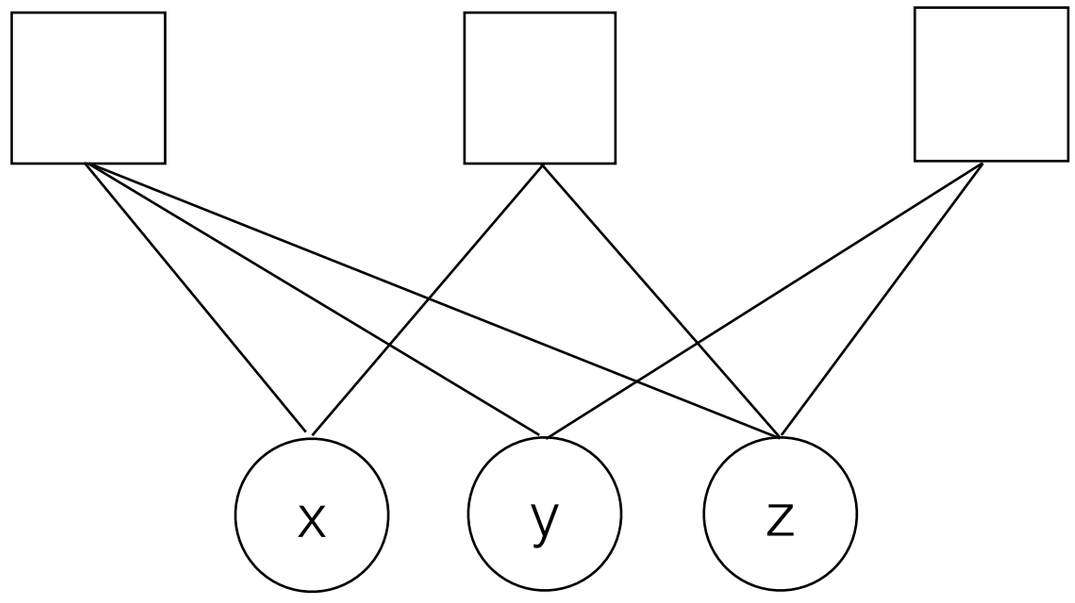


$$(x \vee \neg y \vee z) \wedge (\neg x \vee \neg z) \wedge (y \vee z)$$

primal graph



incidence graph



β-hypertree width

incidence clique-width

directed incidence clique-width

incidence treewidth

primal treewidth

β-hypertree width

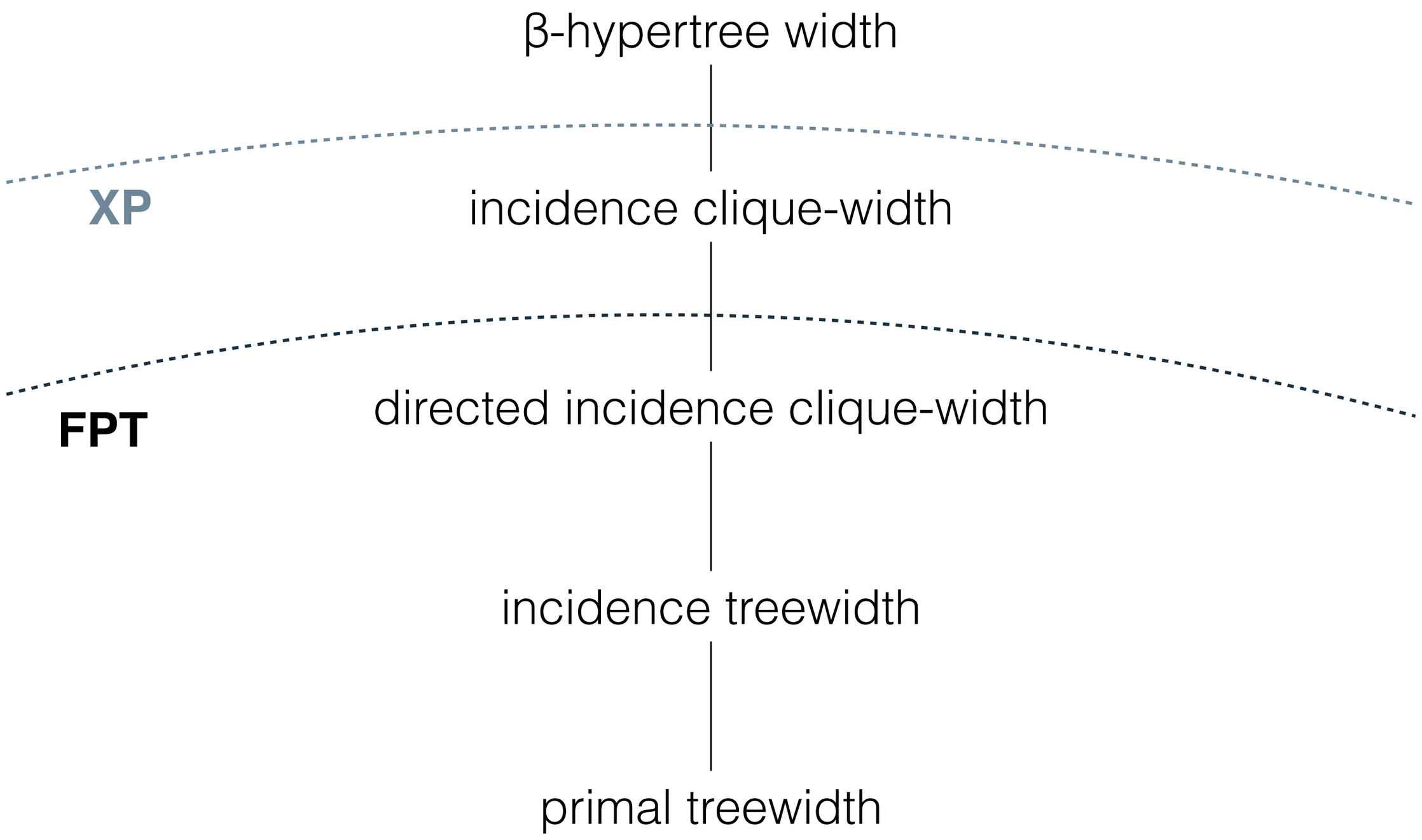
incidence clique-width

FPT

directed incidence clique-width

incidence treewidth

primal treewidth


β-hypertree width
XP
incidence clique-width
FPT
directed incidence clique-width
incidence treewidth
primal treewidth

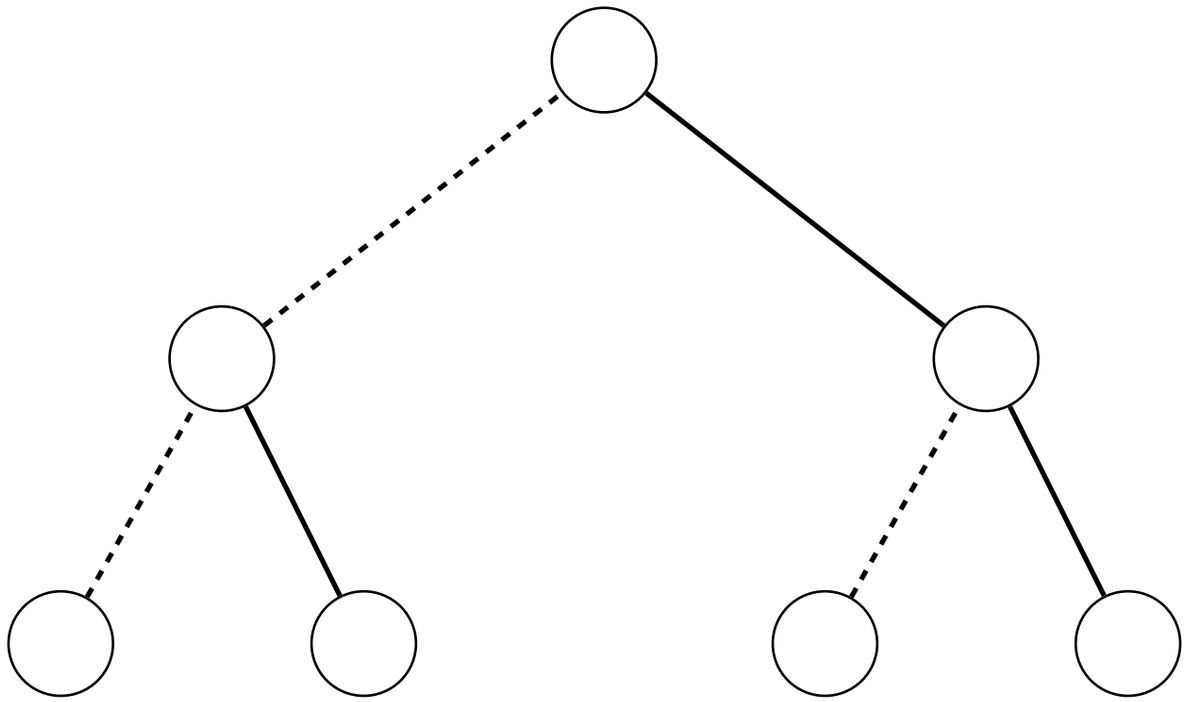
QSAT

$$\forall \mathbf{x}\ \exists \mathbf{y}\ (x \vee \neg y) \wedge (\neg x \vee y)$$

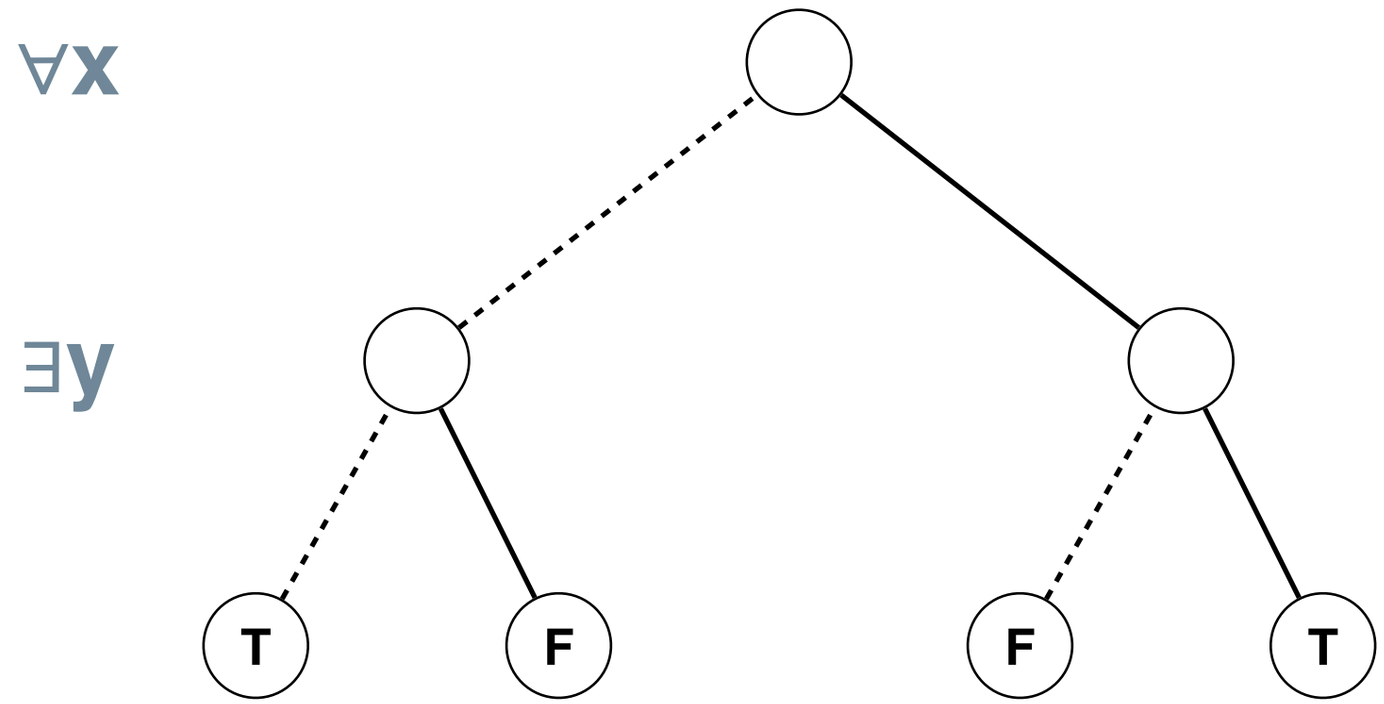
$$\forall \mathbf{x}\ \exists \mathbf{y}\ (x \vee \neg y) \wedge (\neg x \vee y)$$

$\forall \mathbf{x}$

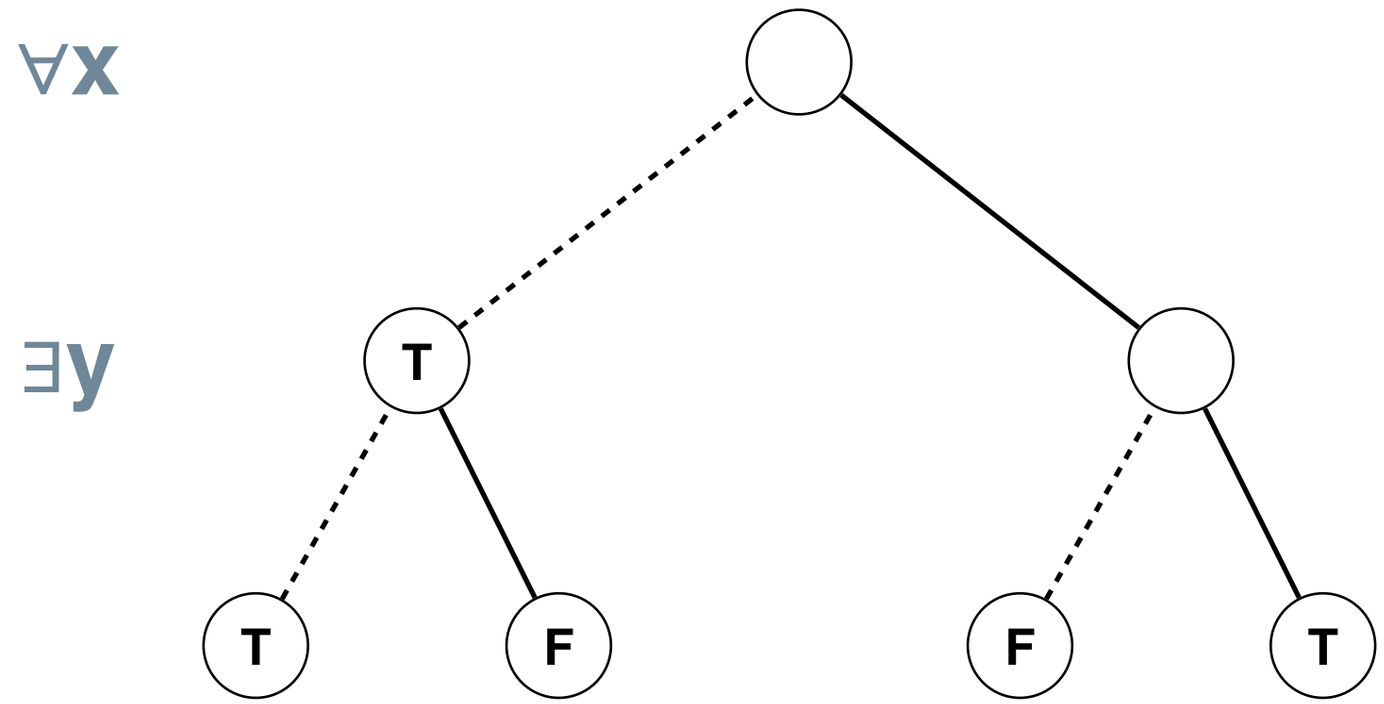
$\exists \mathbf{y}$



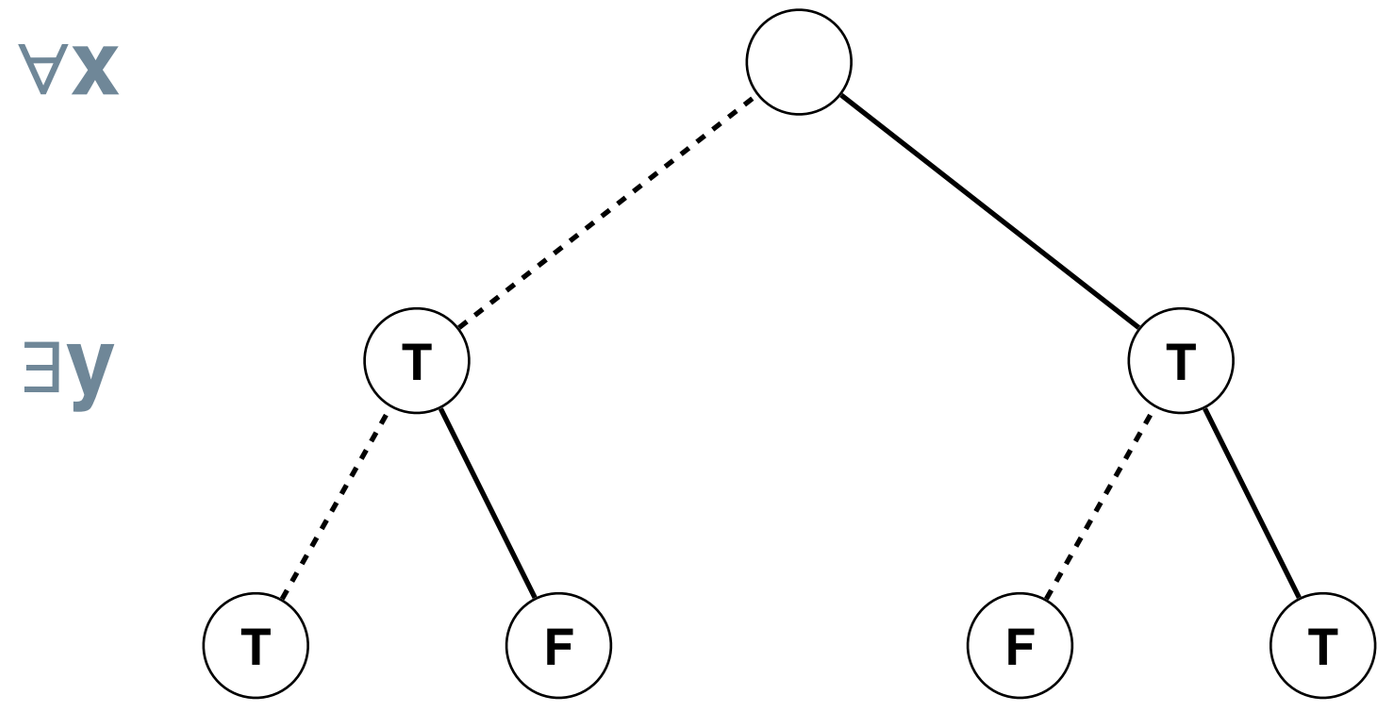
$$\forall \mathbf{x}\ \exists \mathbf{y}\ (x \vee \neg y) \wedge (\neg x \vee y)$$



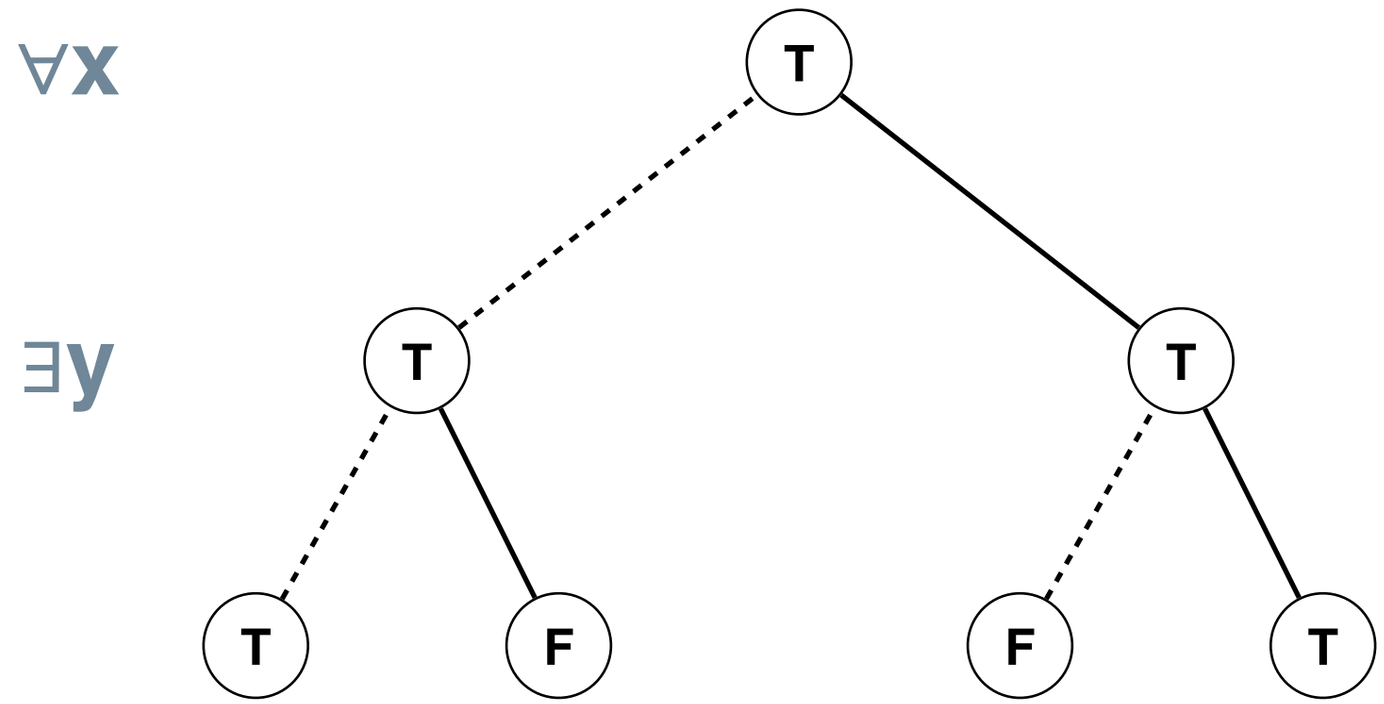
$$\forall x\ \exists y\ (x \vee \neg y) \wedge (\neg x \vee y)$$



$$\forall \mathbf{x}\ \exists \mathbf{y}\ (x \vee \neg y) \wedge (\neg x \vee y)$$



$$\forall x\ \exists y\ (x \vee \neg y) \wedge (\neg x \vee y)$$



QSAT

Instance: A Quantified Boolean Formula **F**

Problem: Decide whether **F** is true

QSAT

Instance: A Quantified Boolean Formula **F**

Problem: Decide whether **F** is true

QSAT is **PSPACE**-complete

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Instance: A Quantified Boolean Formula **F**

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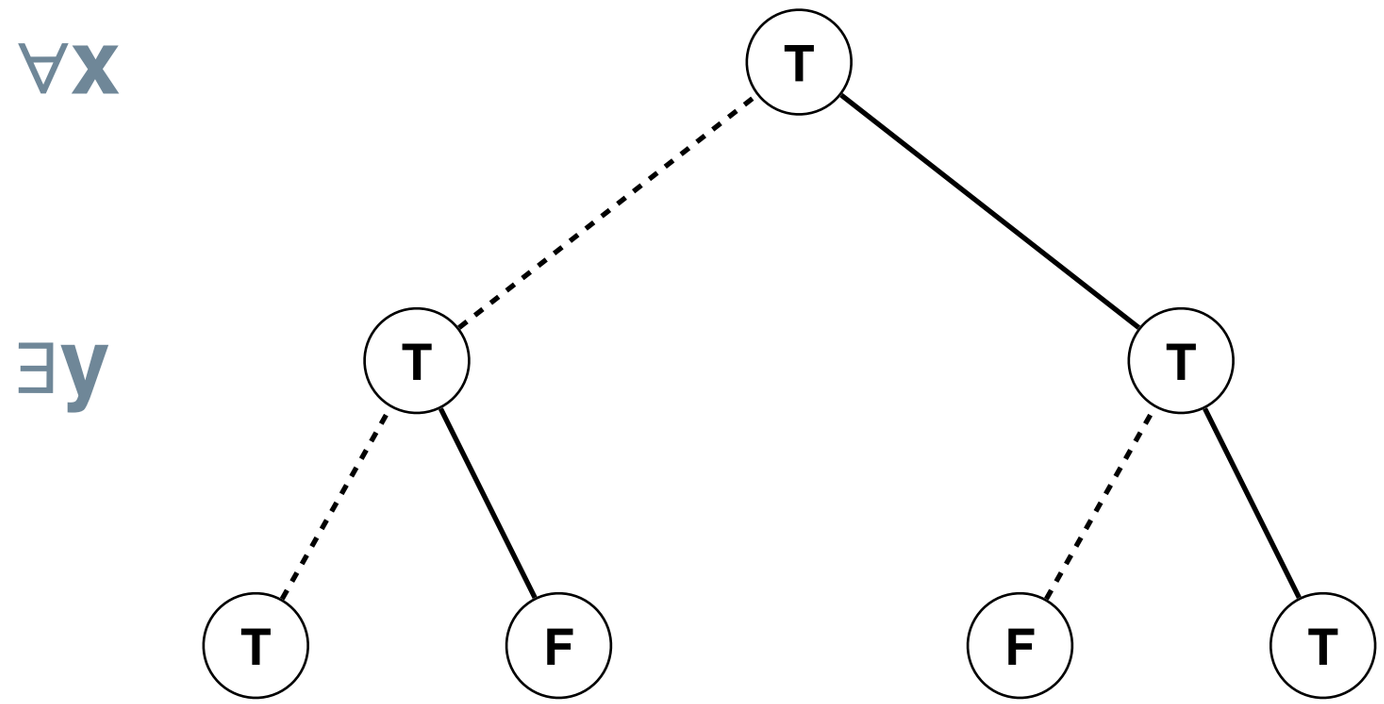
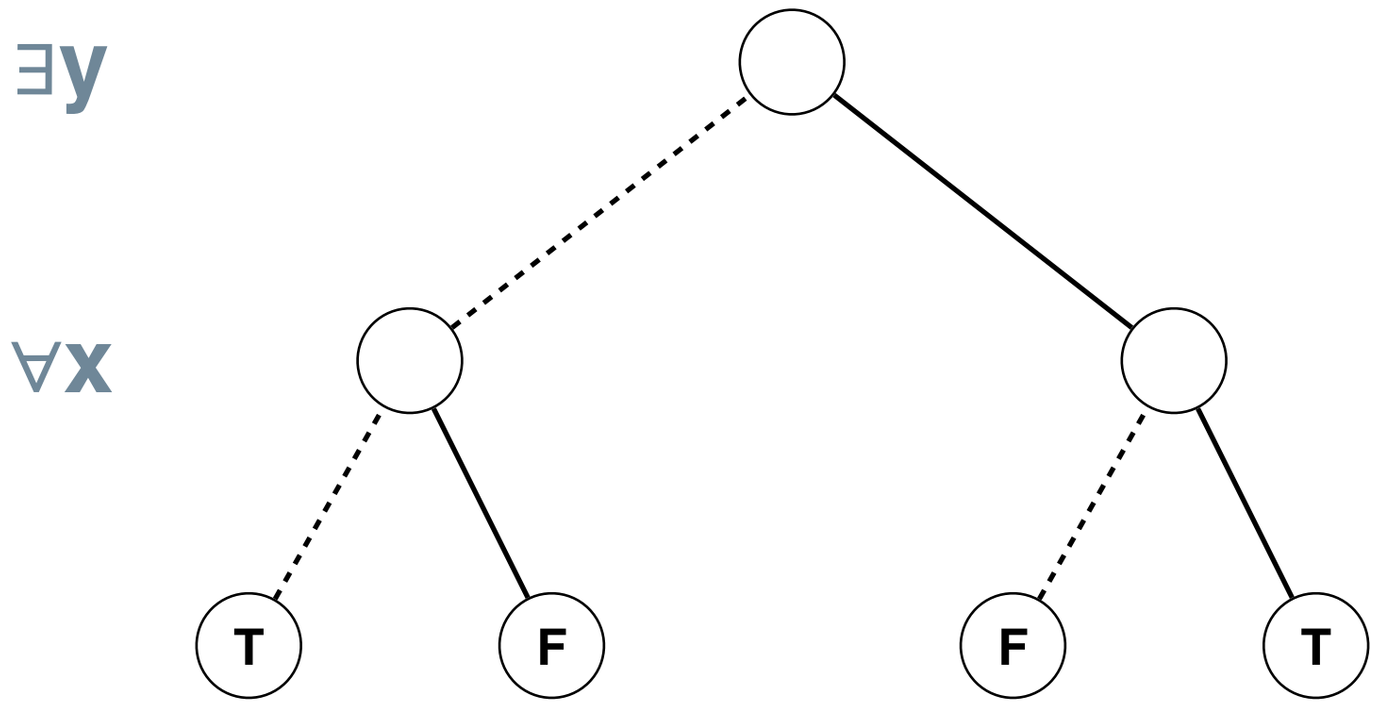
QSAT is **PSPACE**-complete

Applications in Planning, Model Checking, Synthesis

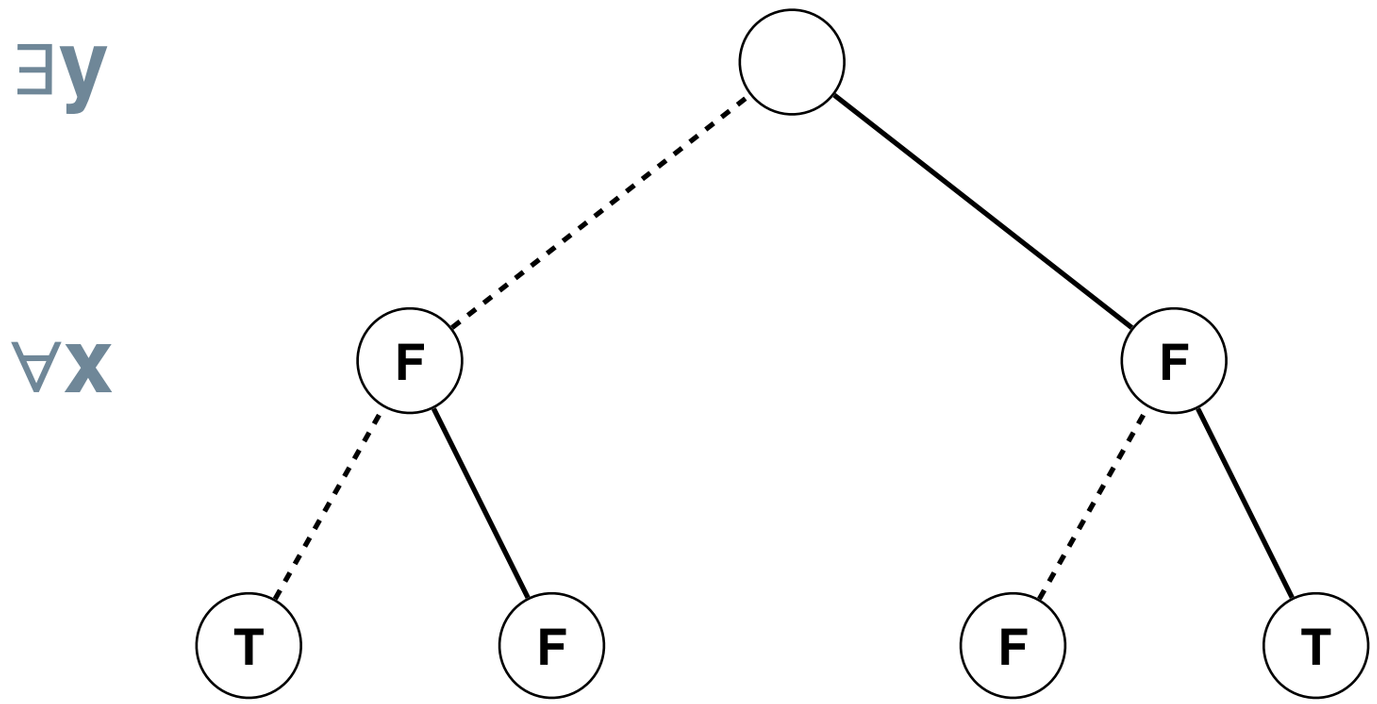
$$\forall x\ \exists y\ (x \vee \neg y) \wedge (\neg x \vee y)$$



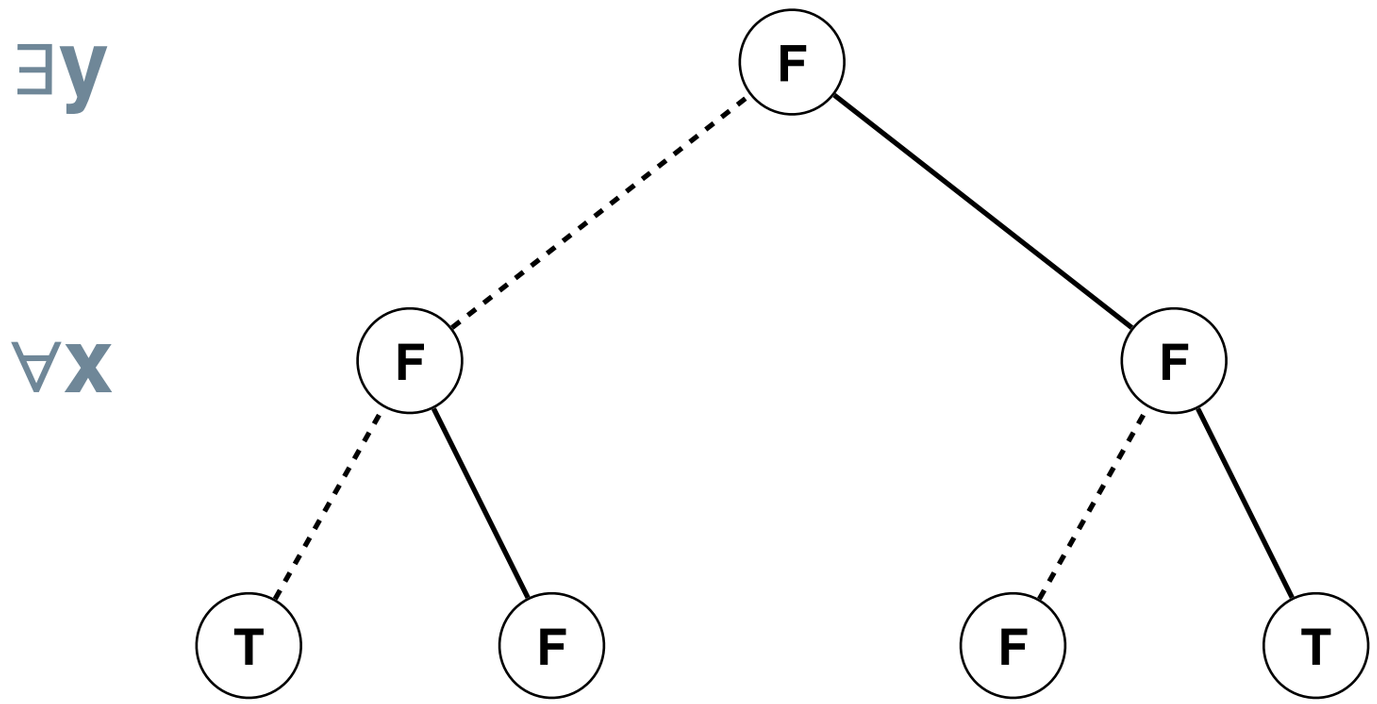
$$\forall \mathbf{x}\ \exists \mathbf{y}\ (x \vee \neg y) \wedge (\neg x \vee y)$$

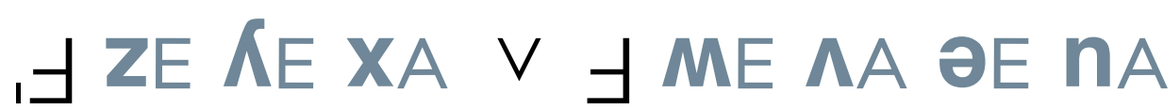


$$\forall \mathbf{x}\ \exists \mathbf{y}\ (x \vee \neg y) \wedge (\neg x \vee y)$$



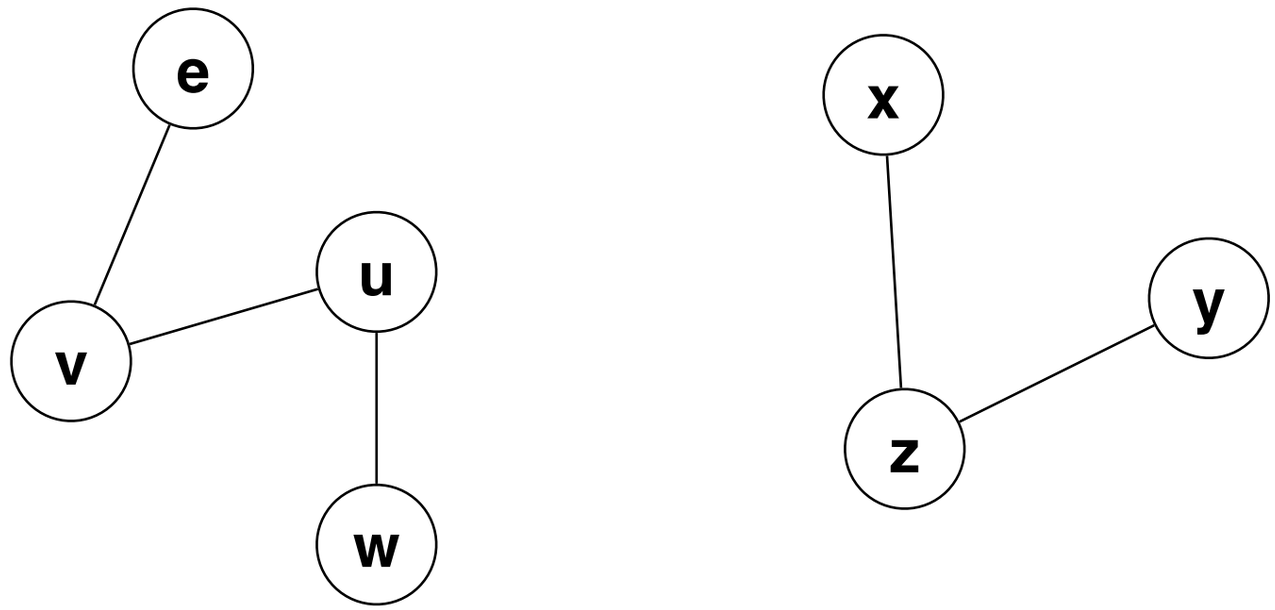
$$\forall x\ \exists y\ (x \vee \neg y) \wedge (\neg x \vee y)$$



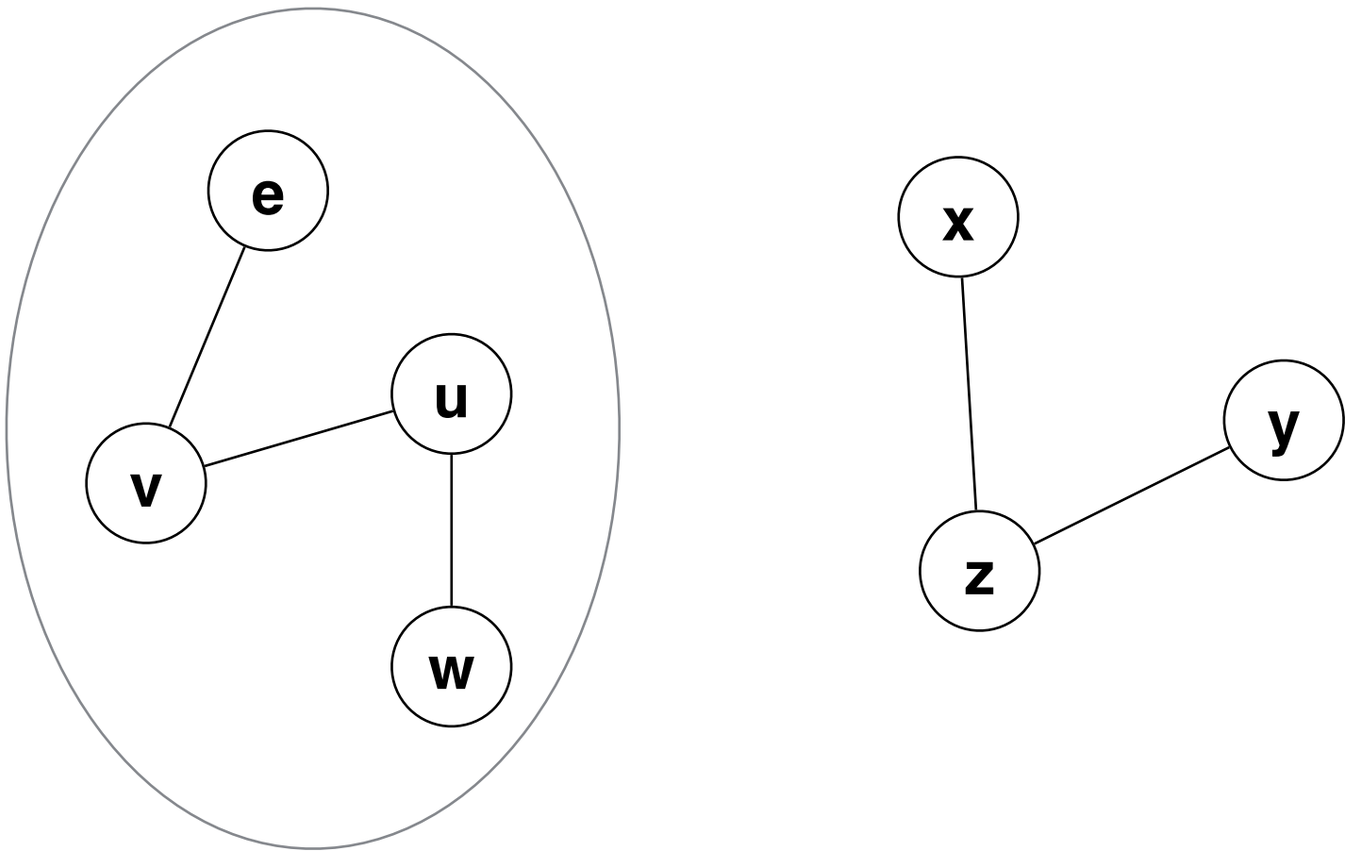


$$\forall u\ \exists e\ \forall v\ \exists w\ \forall x\ \exists y\ \exists z\ F \wedge F'$$

$$\forall u\ \exists e\ \forall v\ \exists w\ \forall x\ \exists y\ \exists z\ F \wedge F'$$



$$\forall u\ \exists e\ \forall v\ \exists w\ \forall x\ \exists y\ \exists z\ F \wedge F'$$



$$\forall u\ \exists e\ \forall v\ \exists w\ \forall x\ \exists y\ \exists z\ F \wedge F'$$