­­­­CSC 330 – Artificial Intelligence

**Video #2 – Homework Problems**

Convert the following set of first-order logic statements to conjunctive normal form (CNF).

∀x ( wise( x ) 🡨🡪 ¬fool( x ) )

* ∀x ( (wise( x ) 🡪 ¬fool( x )) ˄ (¬fool( x ) 🡪 wise( x ))
* ∀x ( (¬wise( x ) ∨ ¬fool( x )) ˄ (fool( x ) ∨ wise( x )) )
* ( (¬wise( x ) ∨ ¬fool( x )) ˄ (fool( x ) ∨ wise( x )) )
* (¬wise( x ) ∨ ¬fool( x ))

(fool( x ) ∨ wise( x ))

* ¬wise( x ) ∨ ¬fool( x )

fool( y ) ∨ wise( y )

∀x ( pet( x ) 🡪 ( dog( x ) ∨ cat( x ) ) )

* ∀x ( ¬pet( x ) ∨ ( dog( x ) ∨ cat( x ) ) )
* ∀z ( ¬pet( z ) ∨ ( dog( z ) ∨ cat( z ) ) )
* ¬pet( z ) ∨ dog( z ) ∨ cat( z )

∀x ( person( x ) 🡪 ( ∃y ( owns( x, y ) ˄ loves( x, y ) ) ) )

* ∀x ( ¬person( x ) ∨ ( ∃y ( owns( x, y ) ˄ loves( x, y ) ) ) )
* ∀u ( ¬person( u ) ∨ ( ∃v ( owns( u, v ) ˄ loves( u, v ) ) ) )
* ∀u ∃v ( ¬person( u ) ∨ ( owns( u, v ) ˄ loves( u, v ) ) )
* ∀u ( ¬person( u ) ∨ ( owns( u, sk-of(u) ) ˄ loves( u, sk-of(u) ) ) )
* ( ¬person( u ) ∨ ( owns( u, sk-of(u) ) ˄ loves( u, sk-of(u) ) ) )
* (¬person( u ) ∨ owns( u, sk-of(u) ) ) ˄ (¬person( u ) ∨ loves( u, sk-of(u) ) )
* ¬person( u ) ∨ owns( u, sk-of(u) )

¬person( u ) ∨ loves( u, sk-of(u) )

* ¬person( u ) ∨ owns( u, sk-of(u) )

¬person( w ) ∨ loves( w, sk-of(w) )

∃x ∀y ( dog( y ) 🡪 loves( x, y ) )

* ∃x ∀y ( ¬dog( y ) ∨ loves( x, y ) )
* ∃s ∀t ( ¬dog( t ) ∨ loves( s, t ) )
* ∀t ( ¬dog( t ) ∨ loves( sk1, t ) )
* ( ¬dog( t ) ∨ loves( sk1, t ) )
* ¬dog( t ) ∨ loves( sk1, t )

Use the following set of first-order logic statements (that are already in CNF) to prove that Rex is a pet; in other words, that pet( Rex ) is true.

1. owns( James, Rex )
2. pet( x ) ∨ ¬owns( sk-of(x), x ) ∨ ¬animal( x )
3. cat( Rex )
4. ¬cat( y ) ∨ animal( y )
5. ¬pet ( Rex ) (Assumption)
6. pet ( Rex ) ∨ ¬animal( Rex ) (1, 2, sk-of(x) | James, x | Rex)
7. animal ( Rex ) (3, 4, y | Rex)
8. pet ( Rex ) (6, 7)
9. FALSE

🡪 pet( Rex ) is True