Mathmatical Logic HW #7

① ② $\exists x \left(L(x) \wedge \forall y \left(S(y) \rightarrow P(x,y)\right)\right)$

$L(x)$ = x is the lecturer

$S(x)$ = x is the student

$P(x,y)$ = x teaches y

④ $\exists x \left(S(x) \wedge \forall y \left(L(y) \rightarrow P(y,x)\right)\right)$

⑥ $\exists x \left(L(x) \wedge \forall y \left(S(y) \rightarrow \neg P(x,y)\right)\right)$

② ⑥ U = courses and people

$C(x)$ = course at tal college

$S(x)$ = a student

$F(x)$ = a female

$P(x,y)$ = x takes course y

$\forall x \left(C(x) \rightarrow \forall y \left(\left(S(y) \wedge P(y,x)\right) \rightarrow F(y)\right)\right)$

⑦ Universe = people

$K(x,y)$ = x knows y

$\exists x \left(\forall y \left(K(x,y)\right) \wedge \exists y \left((x \neq y) \wedge \exists z \left(\neg K(z,y)\right)\right)\right)$

③ ② $\forall x \left(H(x) \leftrightarrow \neg M(x)\right)$

U = people

$M(x)$ = x is old

$H(x)$ = x is young

$F(x,y)$ = x and y are relatives

④ $\exists x \left(\neg H(x) \wedge \neg M(x)\right) \rightarrow \forall x \exists y \left(F(x,y)\right)$

④ ② $\exists x \left(S(x) \wedge \forall y \left(\left(T(y) \wedge T(x,y)\right) \rightarrow \neg R(x,y)\right)\right)$

U = everything

④ $\forall x \left(S(x) \rightarrow \left(D(x) \rightarrow \forall y \left(\left(T(y) \wedge T(x,y)\right) \rightarrow R(x,y)\right)\right)\right)$

$S(x)$ = x is a student

$T(x)$ = x is a test

$D(x)$ = x is ~~diligent~~ diligent

$T(x,y)$ = x has a test y

$R(x,y)$ = x succeeded in test y