1. Find models and counter-models for the following sets of formulas.
   (a) $\forall x \exists y \exists z (E(x,y) \wedge \neg E(x,z))$;
   (b) $\forall x \forall y (x \neq y \to \exists z (E(x,z) \wedge \neg E(y,z)))$;
   (c) $\forall x (\exists y E(x,y) \to P(x))$;
   (d) $\exists x \forall y (f(x,y) = g(y))$.

2. Show that φ is not a consequence of Γ, where
   (a) $\Sigma = \{\ \forall x (P(x) \vee Q(x))\ \}$,
   $\varphi \equiv \forall x P(x) \vee \forall x Q(x)$.
   (b) $\Sigma = \{\ \forall x \forall y (R(x,y) \to R(y,x)), \forall x \forall y \forall z (R(x,y) \wedge R(y,z) \to R(x,z))\ \}$,
   $\varphi \equiv \forall x R(x,x)$.
   (c) $\Sigma = \{\ \forall x \exists y R(x,y)\ \}$,
   $\varphi \equiv \exists y \forall x R(x,y)$.