Additional Exercises about Models & Invalidity in PL

For each of the following arguments, show that the argument is invalid by constructing a model in which the argument has true premises and a false conclusion. Prove this using the method of expansion.

1. $\forall xFx \rightarrow \forall xGx \; / \; \forall x(Fx \rightarrow Gx)$
2. $\exists xFx \vee \exists xGx \; ; \; \exists xGx \; / \; \forall x{\sim}Fx$
3. $\forall x\exists y{\sim}Ryx \; / \; \exists x{\sim}\exists yRxy$
4. $\forall x(Fx \rightarrow Rxx) \; ; \; {\sim}Fa \; / \; {\sim}Raa$
5. $\forall x(Fx \rightarrow Gx) \; ; \; \exists x(Gx \; \& \; Hx) \; / \; \exists x(Fx \; \& \; Hx)$