(1) Show that the filtration $M^f$ of a model $M$ need not be its bounded morphic image.

(2) Show that the temporal modal formula $p \land Hp \rightarrow FHp$ is valid in the frame $(\mathbb{Z}, <)$ where $\mathbb{Z}$ is the set of integer numbers ordered by the usual less-than relation.

(3) What is the standard translation of the following formulas?
   
   (a) $\Box p \rightarrow q$
   (b) $\Diamond(\Box p \rightarrow q)$
   (c) $\Diamond \Box p \rightarrow q$
   (d) $\Box(\Diamond p \land q)$

(4) Prove that the standard translation is correct:
   
   (a) For all models $M$, all states $w \in M$, and all modal formulas $\varphi$, 
   $$M, w \models \varphi \iff M \models ST_x(\varphi)[w].$$
   
   (b) For all models $M$ and all modal formulas $\varphi$, 
   $$M \models \varphi \iff M \models \forall xST_x(\varphi).$$