1)

a)

$$\pi_{userID}\left(\sigma_{noPosts\geq 5}\left(\Upsilon_{userID,\ \text{COUNT}(postID)\longrightarrow noPosts}\left(\sigma_{noLikes\geq 10}\left(\Upsilon_{postID,\ COUNT(userID)\longrightarrow noLikes}\left(\text{Likes}\right)\right)\right)\right)\right)$$

b)

$$\text{Friends} \leftarrow \Upsilon_{userID1,\ \text{COUNT}(userID2)\ \rightarrow\ noFriends}\left(\text{Friendships} \cup \rho_{(userID1,\ userID2)}\left(\text{Friendships}\right)\right)$$

$$\Upsilon_{\text{AVG}(noLikes)\ \rightarrow\ avg}\left(\Upsilon_{postID,\ \text{COUNT}(userID)\ \rightarrow\ noLikes}\left(\text{Likes} \bowtie \pi_{postID}\left(\text{Posts} \bowtie \left(\sigma_{noFriends\geq 50}\left(\text{Friends}\right)\right)\right)\right)\right)$$

$$\cup$$

$$\Upsilon_{\text{AVG}(noLikes)\ \rightarrow\ avg}\left(\Upsilon_{postID,\ \text{COUNT}(userID)\ \rightarrow\ noLikes}\left(\text{Likes} \bowtie \pi_{postID}\left(\text{Posts} \bowtie \left(\sigma_{noFriends<50}\left(\text{Friends}\right)\right)\right)\right)\right)$$

c)

$$\text{NoSubLikes} \leftarrow \Upsilon_{postID,\ \text{COUNT}(userID)\ \rightarrow\ noSubLikes}$$

$$\left(\text{Likes} \bowtie_{\text{Likes}.userID=subscription.userID\ \text{AND}\ \text{Subscriptions}.date\leqslant Likes.timestamp\leqslant\text{Subscriptions}.dop+30} \text{Subscriptions}\right)$$

$$\text{NoLikes} \leftarrow \Upsilon_{postID,\ \text{COUNT}(userID)\ \rightarrow\ noLikes}\text{Likes}$$

$$\pi_{postID,\ noSubLikes\ /\ noLikes\ \rightarrow\ subscribedLikes\%}\left(\text{NoLikes} \bowtie \text{NoSubLikes}\right)$$

2)

a)

$$\pi_{postID}\text{ImagePosts} \subseteq \pi_{postID}\text{Posts}$$

b)

$$\sigma_{paymeth\neq'klarna'\ \text{AND}\ paymeth\neq'swish'\ \text{AND}\ paymeth\neq'card'\ \text{AND}\ paymeth\neq'bitcoin'}\left(\text{Subcription}\right) = \varnothing$$

c)

$$\sigma_{\text{U1}.userID=\text{U2}.userID\ \text{AND}\ \text{U1}.name\neq\text{U2}.name}\left(\rho_{\text{U1}}\left(\text{Users}\right) \times \rho_{\text{U2}}\left(\text{Users}\right)\right)$$