1)

$$(\Pi_{i\_id}(advisor) \subseteq \Pi_{ID}(instructor)) \wedge (\Pi_{s\_id}(advisor) \subseteq \Pi_{ID}(student))$$

2)

$$re\_student = \rho_{(s\_id,s\_name,s\_dept\_name,tot\_cred)}(student)$$

$$re\_instructor = \rho_{(i\_id,i\_name,i\_dept\_name,salary)}(instructor)$$

$$IS\_ship = (re\_student \bowtie advisor) \bowtie re\_instructor$$

$$crox\_dept = \sigma_{s\_dept\_name<>i\_dep\_name}(IS\_ship)$$

$$result = \Pi_{i\_id,s\_id,i\_name,s\_name,i\_dept\_name,s\_dept\_name,}(corx\_dept)$$

3)

$$G(\Pi_{ID}(instructor) - \Pi_{ID}(\rho_{(s\_id,ID)}(advisor)))$$

4)

$$\Pi_{ID,name}((student \bowtie takes) \div \Pi_{course\_id}(\sigma_{dept\_name='SE'}(course)))$$