

Logic final exam

Time limit: 2 hours

Permitted resources: your brain

Instructions: (1) Read the exam all the way through before you begin.
(2) Write your preceptor's name on your exam booklet.

1. Translate the following sentences into predicate logic. Use a relation symbol Lxy for " x loves y ," and use the equality symbol $=$ when appropriate. (You don't need a separate predicate symbol for " x is a person.")
 - (a) Anne loves all people who do not love themselves.
 - (b) There is a person who does not love herself.
 - (c) Everybody loves Mary.
 - (d) Mary loves nobody but Hannah.
2. Provide a model to show that these four sentences are consistent. (It would suffice to draw an arrow diagram, or to write a domain set and extensions of the relevant symbols.)
3. Show that the first sentence implies that Anne loves herself. (You can use any meta-rules such as cut, so long as long as you include proofs of the cited results.)
4. Show that the first sentence implies that everyone is loved.
5. Show that the last two sentences imply that Mary is the same person as Hannah.
6. Symbolize "there are at least three people," and prove that it follows from the four sentences above.