

Discrete Math Challenge HW 2 (2 points)

Let the predicates F and R be defined as follows:

$F(p, b) = \text{"}p\text{'s favorite book is } b\text{"}$

$R(p, b) = \text{"}p \text{ has read book } b\text{"}$

Now consider the sentence

Everyone either has a favorite book, or has never read any books.

- (a) Encode this sentence in propositional logic using the predicates F and R .
- (b) Use a sequence of logical equivalences to explain why the above sentence is logically equivalent to the sentence

Everyone who has read at least one book has a favorite book.

- (c) Let the predicate Q be defined as

$Q(p, b_1, b_2) = p \text{ likes } b_1 \text{ at least as much as } b_2.$

In other words, $Q(p, b_1, b_2)$ holds when p likes b_1 better than b_2 , or likes them equally. Now suppose we define $F(p, b)$ (" p 's favorite book is b ") to mean " p likes b at least as much as any book they have read". Show how to encode this definition for F in terms of R and Q .