

Problem 3. Consider the following predicates: $F(x) \equiv$ "x is a freshman" and $P(x) \equiv$ "x is a part-time student." Write the proposition $\exists x(P(x) \wedge \neg F(x))$ as an English sentence.

There is a part-time student who is not a freshman.

Problem 4. Give the form of the following argument and establish its validity:

"Joy is a Math major or a CS major. If Joy does not know Discrete Math, she is not a Math major. If Joy knows Discrete Math, she is smart. Joy is not a CS major. Therefore, Joy is smart."

$M \equiv$ "Joy is a math major"

$C \equiv$ "Joy is a CS major"

$d \equiv$ "Joy knows Discrete Math"

$S \equiv$ "Joy is smart."

Argument form:

$M \vee C$

$\neg d \rightarrow \neg M$

$d \rightarrow S$

$\neg C$

$\therefore S$

Validity:

$M \vee C$

$\neg C$

M

$\neg d \rightarrow \neg M$

$\neg \neg d$

d

$d \rightarrow S$

$\therefore S$

} Hypothesis

Disjunctive syllogism

Hypothesis

Modus tollens

double negation

Hypothesis

Modus ponens.

The form is valid.