FIL1006 - oblig 2

Bjørn-Andreas Lamo
janilam

21.02.18

1 Relations

I'm using the term "operand" for what has the relation, because relations are somewhat similar to operators.

(a) What is it for a relation to be reflexive?

- The reflexive relation is a relation to the operand itself.

(b) What is it for a relation to be symmetric?

- The operands must be commutative.

(c) What is it for a relation to be transitive?

- Given that there is a relation between a and b, and the same relation between b and c, if the relation is transitive there must also be a relation between a and c.

(d) Is the relation 'x is related as a family member to y' an equivalence relation? Discuss.

- No, it's not. First think intuitively; are everyone that are related to you as a family member also you? Thought not. The "family member" relation is both symmetric and transitive, but not reflexive.

2 Formalize the statement

(a) Formalize the following statement using truth-functional connectives and sentence variables.
"Either the President is not a genius, or, if there is a conspiracy, then neither the Senator nor the judge is right."

- p = the president is not a genius
- q = the senator is right
- r = the judge is right
- s = there is a conspiracy
- $t = s \supset \neg(q \vee r)$
- $(p \wedge \neg t) \vee (\neg p \wedge t)$

(b) Does the statement in (a) imply that the Senator is right?

- No, it does not imply the Senator to be right.
$(p \wedge \neg t) \vee (\neg p \wedge t) \equiv (p \wedge s \wedge (q \vee r)) \vee (p \vee (s \wedge (q \vee r)))$
We can see that in the equivalent statement the "q" variable is connected to an "or" operator, therefore we cannot say the statement implies anything from the variable.

3 Insert quotation marks

(a) Bernhard Borge is a pseudonym for the author André Bjerke.

- "Bernhard Borge" is a pseudonym for the author André Bjerke.

(b) Be not afraid of greatness is a quote from a play called The Twelfth Night.

- "Be not afraid of greatness" is a quote from a play called The Twelfth Night.

(c) One of the De Morgan equivalences is $-p. - q$ is equivalent to $-(p \vee q)$.

- One of the De Morgan equivalences is $"-p. - q"$ is equivalent to $"-(p \vee q)"$.

(d) River Thames consists of 10 letters and rhymes with burning flames.

- "River Thames" consists of 10 letters and rhymes with "burning flames".

4 Natural deduction

(a) $"p \supset q \vee r"$ and $"-r"$ implies $"p \supset q"$

[1]	(1)	$p \supset q \vee r$	P
[2]	(2)	$\neg r$	P
[3]	(3)	p	P
[1][3]	(4)	$q \vee r$	(1)(3) MP
[1][2][3]	(5)	q	(2)(4) CE
[1][2]	(6)	$p \supset q$	[3](5) D

(b) $"p \wedge q"$ and $"q \supset r"$ implies $"p \wedge (r \vee q)"$

[1]	(1)	$p \wedge q$	P
[2]	(2)	$p \supset r$	P
[1]	(3)	p	(1) CE
[1]	(4)	q	(1) CE
[4]	(5)	$r \vee q$	(4) DI
[1][4]	(6)	$p \wedge (r \vee q)$	(3)(5) CI

(c) $"p \supset \neg q"$ and $"r \vee s \supset q"$ implies $"r \supset \neg p"$

[1]	(1)	$p \supset \neg q$	P
[2]	(2)	$r \vee s \supset q$	P
[3]	(3)	r	P
[2][3]	(4)	q	(2)(3) MP
[2][3]	(5)	$\neg\neg q$	(4) DN
[1][2][3]	(6)	$\neg p$	(1)(5) MT
[1][2]	(7)	$r \supset \neg p$	[3](6) D

(d) "$p \supset \neg q$" implies "$p \wedge r \supset (q \vee r \supset r)$"

[1]	(1)	$p \supset \neg q$	P
[2]	(2)	$p \wedge r$	P
[2]	(3)	r	(2) CE
[2]	(4)	$q \vee r$	(3) DI
[2]	(5)	$q \vee r \supset r$	(3)(4) D
[]	(6)	$p \wedge r \supset (q \vee r \supset r)$	[2](5) D

5 Natural deduction II

By using natural deduction, show that "$p \supset (q \supset r)$" is equivalent to "$p \wedge q \supset r$".

[1]	(1)	$p \wedge q \supset r$	P
[2]	(2)	p	P
[3]	(3)	q	P
[2][3]	(4)	$p \wedge q$	(2)(3) CI
[1][2][3]	(5)	r	(1)(4) MP
[1][2]	(6)	$q \supset r$	[3](5) D
[1]	(7)	$p \supset (q \supset r)$	[2](6) D

[1]	(1)	$p \supset (q \supset r)$	P
[2]	(2)	$p \wedge q$	P
[2]	(3)	p	(2)CE
[2]	(4)	q	(2) CE
[1][2]	(5)	$q \supset r$	(1)(3) MP
[1][2]	(6)	r	(4)(5) MP
[1]	(7)	$p \wedge q \supset r$	[2](6) D