

Assignment #3

CIS 427/527

Group 2

January 23, 2016

1

Show that the following propositions are derivable:

- (a) $\varphi \rightarrow \varphi$
- (b) $\perp \rightarrow \varphi$
- (c) $\neg(\varphi \wedge \neg\varphi)$
- (d) $(\varphi \rightarrow \psi) \leftrightarrow \neg(\varphi \wedge \neg\psi)$
- (e) $(\varphi \wedge \psi) \leftrightarrow \neg(\varphi \rightarrow \neg\psi)$
- (f) $\varphi \rightarrow (\psi \rightarrow (\varphi \wedge \psi))$

2

Show that the following propositions are derivable:

- (a) $(\varphi \rightarrow \neg\varphi) \rightarrow \neg\varphi$
 - (b) $[\varphi \rightarrow (\psi \rightarrow \sigma)] \leftrightarrow [\psi \rightarrow (\varphi \rightarrow \sigma)]$
 - (c) $(\varphi \rightarrow \psi) \wedge (\varphi \rightarrow \neg\psi) \rightarrow \neg\varphi$
 - (d) $(\varphi \rightarrow \psi) \rightarrow [(\varphi \rightarrow (\psi \rightarrow \sigma)) \rightarrow (\varphi \rightarrow \sigma)]$
- TYPO – NEED CLARIFICATION

3

Show:

- (a) $\varphi \vdash \neg(\neg\varphi \wedge \psi)$
- (b) $\neg(\varphi \wedge \neg\psi), \varphi \vdash \psi$
- (c) $\neg\varphi \vdash (\varphi \rightarrow \psi) \leftrightarrow \neg\varphi$
- (d) $\vdash \varphi \Rightarrow \vdash \psi \rightarrow \varphi$
- (e) $\neg\varphi \vdash \varphi \rightarrow \psi$