

Analyse the following arguments and decide (prove) which of them are valid:

A<sub>1</sub>     *Tom does not know that Francisco is the Pope.*  
 -----  
           *The Pope exists.*

Note. Recall that *Knowing* is a factivum. The premise is to be read as denoting the proposition that takes the value **F**.

A<sub>2</sub>     *Tom knows that the Mayor of Ostrava is Ivo.*  
           *Tom believes of the Mayor of Ostrava that he is in danger.*  
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           *Tom believes that Ivo is in danger.*

A<sub>3</sub>     *Tom knows that the Mayor of Ostrava is Ivo.*  
           *Tom believes that the Mayor of Ostrava is in danger.*  
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           *Tom believes of the Mayor of Ostrava that he is in danger.*

Consider both types of knowing and believing, i.e., intensional *Know*, *Believe*/ $(\text{OI}\text{O}_{\tau\text{O}})_{\tau\text{O}}$  as well as hyperintensional *Know\**, *Believe\**/ $(\text{OI}^*\text{I})_{\tau\text{O}}$ .

In other words, decide whether and under which additional conditions *de dicto* attitudes entail *de re* attitudes, and vice versa.

Remember that in general, *de dicto* and the respective *de re* attitudes are logically independent, as the following example makes it obvious:

*Tom believes that the Pope is not a pope.*  
*Tom believes of the Pope that he is not a pope.*

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