

7.6.x. Exercise questions

1. Use the system of derivations to establish each of the following. You may use detachment and attachment rules. Exercises **h** and **i** are contrived to require the rule MCR for exploiting restricted universals; any restricted universals in the others may be exploited using the detachment rules.
 - a. $\forall x \forall y Rxy, (\forall x: Rxx) Gx \Rightarrow Ga$
 - b. $(\forall x: Fx) Gx \Leftrightarrow \forall x (Fx \rightarrow Gx)$
 - c. $Fa \Leftrightarrow (\forall x: x = a) Fx$
 - d. $\forall x \forall y (Rxy \rightarrow \neg Ryx) \Rightarrow \forall x (\forall y: \neg x = y) \neg (Rxy \wedge Ryx)$
 - e. $\forall x (\forall y: \neg x = y) \neg (Rxy \wedge Ryx), \forall x \neg Rxx \Rightarrow \forall x \forall y (Rxy \rightarrow \neg Ryx)$
 - f. *Everyone loves everyone who loves anyone \Rightarrow If anyone loves anyone, then everyone loves everyone*
 - g. $\forall x (\forall y: gx = y) Fy \Rightarrow \forall x F(g(hx))$
 - h. $\forall x \forall y Rxy, (\forall x: \forall y Ryx) (Fx \rightarrow Gx) \Rightarrow (\forall x: Fx) Gx$
 - i. *Al said everything he remembered, Al is a person who said nothing, Anyone who remembered nothing forgot everything \Rightarrow Al forgot everything*
2. In the following, certain alternative expressions are enclosed in brackets and separated by vertical bars. Choose one of each alternative pair of premises and one of each alternative pair of words or phrases in the conclusion so as to make a valid argument; then analyze the premises and conclusion and construct a derivation to show that the argument is valid. You may use detachment and attachment rules.
 - a. *Every road sign was colored*
 [Every stop sign was a road sign | Every road sign was a traffic marker]
 [If anything was red, it was colored | If anything was colored, it was painted]

Every [stop sign | traffic marker] was [red | painted]
 - b. *No road sign was colored*
 [Every stop sign was a road sign | Every road sign was a traffic marker]
 [If anything was red, it was colored | If anything was colored, it was painted]

No [stop sign | traffic marker] was [red | painted]

- c. *Only road signs were colored*
 [Every stop sign was a road sign | Every road sign was a traffic marker]
 [If anything was red, it was colored | If anything was colored, it was painted]
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- d. *Only [stop signs | traffic markers] were [red | painted]*
 Among road signs all except colored ones were replaced
 [Every stop sign was a road sign | Every road sign was a traffic marker]
 [If anything was red, it was colored | If anything was colored, it was painted]
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- e. *Everyone watched every snake*
 [Every cobra is a snake | Every snake is a reptile]
 Everyone watched every [cobra | reptile]
- f. *No one watched every snake*
 [Every cobra is a snake | Every snake is a reptile]
 No one watched every [cobra | reptile]
- g. *No one watched any snake*
 [Every cobra is a snake | Every snake is a reptile]
 No one watched any [cobra | reptile]
- h. *Everyone who likes every snake was pleased*
 [Every cobra is a snake | Every snake is a reptile]
 Everyone who likes every [cobra | reptile] was pleased
- i. *Everyone who likes a snake was pleased*
 [Every cobra is a snake | Every snake is a reptile]
 Everyone who likes a [cobra | reptile] was pleased