1. Consider the following problem:

Aaron, Bob, and Chad all go out to eat together every day for lunch. They each order either a ham sandwich or a pork loin. However, they always adhere to the following rules:

i. If Aaron orders ham, Chad orders pork.
ii. Either Aaron or Bob orders ham, but not both.
iii. Bob and Chad do not both order pork

Let A be the statement ‘Aaron orders ham’. Let B be the statement ‘Bob orders ham’. And let C be the statement ‘Chad orders ham’.

(a) What does \( \sim A \) mean?

(b) Symbolize statement i.

(c) Symbolize statement ii.

(d) Symbolize statement iii.

(e) Symbolize statement i using only \( \land, \lor, \sim \). (i.e. without using \( \Rightarrow \).)

(f) Use De Morgan’s Laws to symbolize statement iii using only \( \lor \).

(g) Let \( E = i \land ii \land iii \). Simplify E assuming \( A = T \).

(h) Simplify E assuming \( A = F \).
(i) What can we conclude from the previous parts in terms of the problem?

(j) Simplify $E$ assuming $B = F$ (and not knowing anything about $A$).

(k) Simplify $E$ assuming $B = T$ (and not knowing anything about $A$).

(l) What can we conclude from the previous parts in terms of the problem?

(m) Simplify $E$ assuming $C = T$ (and not knowing anything about $A$ or $B$).

(n) Simplify $E$ assuming $C = F$ (and not knowing anything about $A$ or $B$).

(o) What can we conclude from the previous parts in terms of the problem?

(p) Write a proof of "Aaron eats pork and Bob eats ham".