

Closed book. Closed Notes. Please write very legibly.

1. (20 points) Construct a derivation for the following argument by using tautologies 1-40 and rules p , t , ug , us , es , and eg .

All rational numbers are real numbers. Some rationals are integers. Therefore, some real numbers are integers. (Qx : x is rational; Rx : x is real; Zx : x is an integer.)

2. (20 points) Construct a derivation for the following argument by using tautologies 1-40 and rules p , t , ug , us , es , and eg .

No Klingon likes any Vulcan. All logical people are Vulcan. Therefore no Klingon likes any logical people. (Kx : x is Klingon; Vx : x is Vulcan; Gx : x is a logical person; Lxy : x likes y .)

(Hint: this is exactly like one of the HW problems, but with new names.)

3. (10 points) Is each of the following true or false? If true, construct a derivation using tautologies 1-40 and rules p , t , ug , us , es , and eg . If false, give an argument to support your answer.
- (a) All freshmen date all sophomores. No freshman dates any junior. There are freshmen. Therefore, no sophomore is a junior. (Fx : x is a freshman; Sx : x is a sophomore; Jx : x is a junior; Dxy : x dates y .)
- (b) All freshmen date all sophomores. No freshman dates any junior. There are sophomores. Therefore, no sophomore is a junior. (Fx : x is a freshman; Sx : x is a sophomore; Jx : x is a junior; Dxy : x dates y .)