

## Exercise 7

Apr 17/22, 2008

1. Given the following definitions of  $C$  and  $A$ , define mappings  $\alpha : C \rightarrow A$  and  $\gamma : A \rightarrow C$  so that  $C \langle \alpha, \gamma \rangle A$  is a Galois connection.
  - (a)  $C: \{ c \mid c \text{ is a set of integers} \}$   
 $A: \{ \geq n \mid n \text{ is an integer} \}$
  - (b)  $C: \{ c \mid c \text{ is memory store in the heap allocated by the program at runtime} \}$   
 $A: \{ a \mid a \text{ is malloc expression in the program} \}$
2. Given a Galois connection  $C \langle \alpha, \gamma \rangle A$  where  
 $C = \{ c \mid c \text{ is a set of integers} \}$   
 $A = \{ \geq n \mid n \text{ is an integer} \}$   
Define the binary relation  $R : Int \rightarrow A$  that implies the given Galois connection. Define  $A' = \gamma A$  so that  $\alpha' : C \rightarrow A'$  becomes a closure map in  $C$ .
3. Given a Galois connection  $C \langle \alpha, \gamma \rangle A$  where  
 $C = \{ c \mid c \text{ is a set of integers} \}$   
 $A = \{ \geq n \mid n \text{ is an integer} \}$   
Define a sound approximation for the integer multiplication operation on  $A$ .