Proofs for Homework 2.
Definitions used:
\[ \text{curry } f \ x \ y = f (x,y) \quad \text{where } f :: (a,b) \to c \]
\[ \text{uncurry } f \ (x, y) = f \ x \ y \quad \text{where } f :: a \to b \to c \]
\[ \text{plus } (x,y) = x + y \]
\[ \text{plusC } x \ y = x + y \]

Proofs by extensionality:

i.) uncurry plusC = plus
Show For all p:(A,B). uncurry plusC p = plus p
let p = (x,y) where x:A and y:B
LHS = uncurry plusC (x,y) = plusC x y = x + y (by def of uncurry, then plus)
RHS = plus (x,y) = x + y

ii.) curry plus = plusC
Show for all x:A and y:B curry plus x y = plusC x y
LHS = curry plus x y = plus (x,y) = x + y (by def of curry, then plusC)
RHS = plusC x y = x + y

iii.) curry(uncurry plusC) = plusC
Show for all x:A and y:B. curry(uncurry plusC) x y = plusC x y
LHS = curry(uncurry plusC) x y = (uncurry plusC) (x,y) (by def curry)
= uncurry plusC (x,y) = plusC x y (by def uncurry)
= x + y
RHS = plusC x y = x + y

iv.) uncurry(curry plus) = plus
Show For all p:(A,B). uncurry(curry plus) p = plus p
Let p = (x,y) where x:A and y:B
LHS = uncurry (curry plus) (x,y) = (curry plus) x y (by def of uncurry)
= curry plus x y = plus (x,y) = x + y (by def of curry)
RHS = plus (x,y) = x + y