CS450 Homework 5

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Part 1 - Question 2:

a. Apply works by applying a procedure to a list of arguments. Essentially it unpacks the list and calls the procedure with all elements of the list as arguments. So, in this case…

(apply stream-map (cons proc (map stream-cdr argstreams)))

evaluates to…

(stream-map proc (stream-cdr stream1) (stream-cdr stream2) etc…)

Because…

(cons proc (map stream-cdr argstreams))

Evaluates to…

(proc, (stream-cdr stream1), (stream-cdr stream2), etc…)

Which is a list that apply can use as arguments for stream-map.

The reason we cannot leave out apply and cons here is because doing so would leave us with this…

(stream-map proc (map proc argstreams))

which evaluates to…

(stream-map proc (list of streams))

Stream map does not take a list of streams as an argument it takes multiple streams. And it is for that reason that we cannot remove apply and cons.

b. This also works because apply can not only take a list of arguments but can also take multiple arguments so long as the last argument is a list. When given multiple arguments apply will expand the list and call the procedure with all the preceding arguments and the arguments from the list. For example,…

(apply + 1 2 3 4 (list 5 6 7 8))

Evaluates to…

(+ 1 2 3 4 5 6 7 8)

And likewise

(apply stream-map proc (map stream-cdr argstreams))

Evaluates to…

(stream-map proc (stream-cdr stream1) (stream-cdr stream2) etc…)

This is the same result we get when evaluating

(apply stream-map (cons proc (map stream-cdr argstreams)))

Part 2 – Question 1