Morgan Baccus
CptS 350
Homework #12

Problem 1

Since $A \leq_m B$, we have a poly-time computable function f such that $\forall x, x \in A$ iff $f(x) \in B$.

Since $B \leq_m C$, we have a poly-time computable function g such that $\forall y, y \in B$ iff $g(y) \in C$.

To show $A \leq_m C$, we need to find a poly-time computable function h such that $\forall x, x \in A$ iff $h(x) \in C$. Here, we take $h = g \circ f$

Problem 2

We need to guess if the question is true and verify.

Guess: There is a sequence of nodes (walk) w such that the length of the wak $|w| \leq k$, where k is the number of nodes (bound by the size of the walk).

Check 1: w is indeed a walk on G in determine poly-time.

Check 2: w covers every node in G exactly once in determine poly-time. (can use a hash table or 2-D array to check since k is limited).

Check 3: If 1 and 2 are true, return true.
else, Crash.

Problem 3

Guess: there is a walk W that runs the following algorithm in T steps where $T \geq k$ (number of nodes in G) to bound the size of the walk or run time.

Check 1: W is a walk on G in determine poly-time T.

Check 2: W covers every node in G in determine poly-time. (Can check using hash table or 2D array since k is limited).

Check 3: If 1 and 2 are true, return true.
Else, crash.

Problem 4

To compare 2 boolean circuits we need to run all possible inputs. Since the input size is n and there is only 0 and 1 for each possible input, we will spend $O(2^n)$ to check if $C_1 = C_2$.