

## CMSC 330 Fall 2016 Quiz #5

Gradescope ID

Discussion Time (circle one) 10am 11am 12noon 1pm 2pm 3pm

Discussion TA (circle one) Alex Austin Ayman Brian Damien Daniel K.  
Daniel P. Greg Tammy Tim Vitung Will K.

### Instructions

- Do not start this quiz until you are told to do so.
- You have 15 minutes for this quiz.
- This is a closed book quiz. No notes or other aids are allowed.
- For partial credit, show all of your work and clearly indicate your answers.

1. (9 points) Given the following clauses, list **all** answers returned by the following queries.

<pre>parent('Abraham', 'Homer'). parent('Penelope', 'Homer').  parent('Homer', 'Bart'). parent('Homer', 'Lisa'). parent('Homer', 'Maggie').  parent('Marge', 'Bart'). parent('Marge', 'Lisa'). parent('Marge', 'Maggie').  grandparent(G,N) :-     parent(G,X),     parent(X,N).  sibling(A,B) :-     parent(P,A), !,     parent(P,B),     A \= B.  sibling2(A,B) :-     parent(P,A),     parent(P,B),     A \= B, !.</pre>	<p>a. (3 pts) sibling('Bart', B).</p> <p>B = 'Lisa'; B = 'Maggie'</p> <p>b. (3 pts) sibling2('Bart', B).</p> <p>B = 'Lisa'</p> <p>c. (3 pts) grandparent(G, 'Maggie').</p> <p>G = 'Abraham'; G = 'Penelope'</p>
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2. (5 points) Define a predicate “remove\_last(L,R)” that takes a list, and sets R to be the list with the last element removed. If the last element is also a list, the entire list should be removed. You may use member(X,L), append(X,Y,R), and sort(X,R) if needed.

**Examples**

```
remove_last([], R) → R = []  
remove_last([1,2,3],R) → R = [1,2]  
remove_last([1,2,[1,2,3]],R) → R = [1,2]
```

**Solution**

```
% Necessary or remove_last([],R) will return false  
remove_last([], []).
```

```
remove_last(L,R) :- append(R, [_], L).
```

3. (6 points) Define a predicate list\_sum(L,X) which, given a list of integers L, returns a list of integers in which each element is the sum of all the elements in L up to the same position.

**Example**

```
List_sum([1,2,3,4],X) → X = [1,3,6,10]
```

**Answer**

- . add\_up\_list(L,K) :- addHelper(L,K,0).
- . addHelper([ ],[ ],-).
- . addHelper([X|L],[Y|K],Z) :- Y is Z+X, addHelper(L,K,Y).

