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CS168 Spring Assignment 7

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Collaborators:

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By turning in this assignment, I agree by the Stanford honor code and declare that all of this is my own work.

Part 1

(a) (a) The circle graph with $n = 10$ is periodic. This is because it is bipartite. Consider partitions A, B where even nodes are in A and odd nodes in B. Then the edges (u, v) exists only if $u \in A, v \in B$. As such, it has a period of 2.

(b) The circle graph with $n = 9$ is aperiodic. Consider any pair of distinct nodes i, j. WLOG, suppose $i < j$. Then we can reach j from i in $j - i$ steps as well as $9 - (j - i)$. Note that $j - i \in \{1, 2, 3, 4, 5, 6, 7, 8\}$ and, correspondingly, we'd have $9 - (j - i) \in \{8, 7, 6, 5, 4, 3, 2, 1\}$. The only pairs for which the GCD is not 1 are $(3, 6), (6, 3)$. However, if we can reach a node in 3 steps, we can reach it in 5 (just go back once and foward again). As such, even for these nodes, the GCD for times at which they are reachable is 1.

(c) The circle graph with $n = 9$ and an extra edges connecting nodes 1 and 5 is aperiodic. Ignoring the extra edge, we already know it's aperiodic as per (2). As such, we only need to verify that the states 1 and 5 are still aperiodic. They are, since we can reach them in either 4 steps or 5 steps.

(b) (your solution)

Part 2

(a) (your solution, with code)

```
def cow():
    print ''Moo''
```

(b) (your solution)