

3.2

ALGORITHM

Run the breadth-first search, obtaining a tree T rooted at u

If $T = G$, where G is the graph

 Then G contains no cycle

Else

 Let $e = \{v, w\}$ be the edge that is in G but not in T

 Then the path $u - v$ and $u - w$, together with e form a cycle

T will include all nodes in G , so to check whether $T = G$, we simply check all edges, running in $O(m)$ time. Together with the fact that BFS runs in $O(m + n)$ time, this algorithm runs in $O(m + n)$ time.