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Week 12

#7

```
# initialize all vertices in G
for each v in G
        v.visited = false
        v.color = nil

# initialize the starting node
s.visited = true
s.color = black
ENQUEUE(Q, s)

# proceed to search through the graph
while Q is not empty
        u = DEQUEUE(Q)
        for each v in Adj[u]
                if v.visited = false
                        v.visited = true
                        if u.color = black
                                v.color = white
                        else
                                v.color = black
                        ENQUEUE(Q, v)
                else
                        if v.color = u.color
                                return false
return true
```

Runtime Justification:

The runtime should still be $O(V + E)$. The only change from the original algorithm is that we add some constant work for each vertex in a separate if conditional. Each vertex is placed in the queue exactly once, and each edge is placed twice.