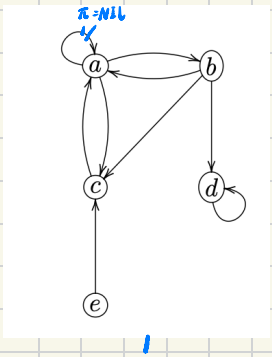
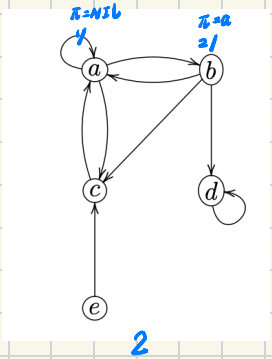
Exercise sheet 14

Question 14.1



1



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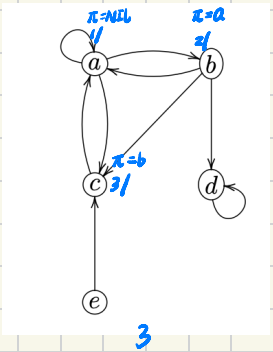
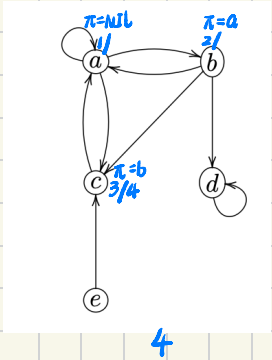


3



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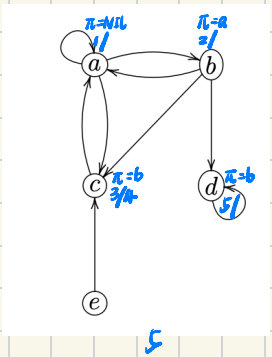
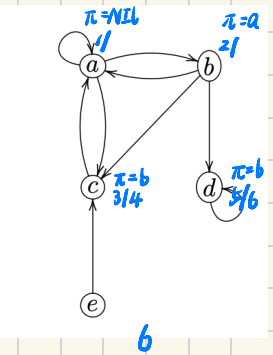
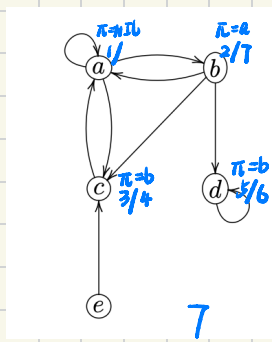


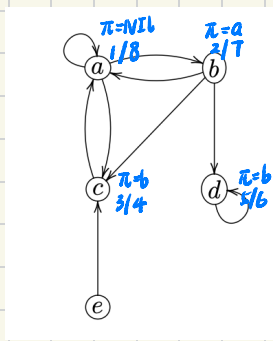
5



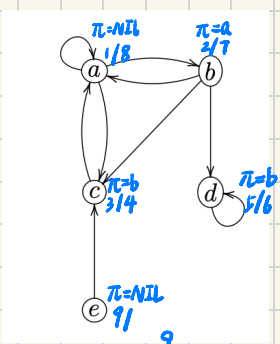
6



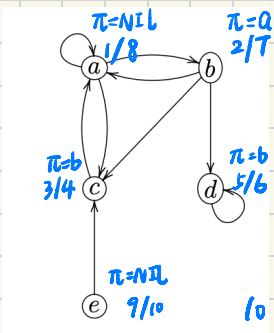
7



8



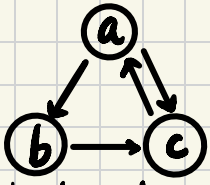
9



10

Question 14.2

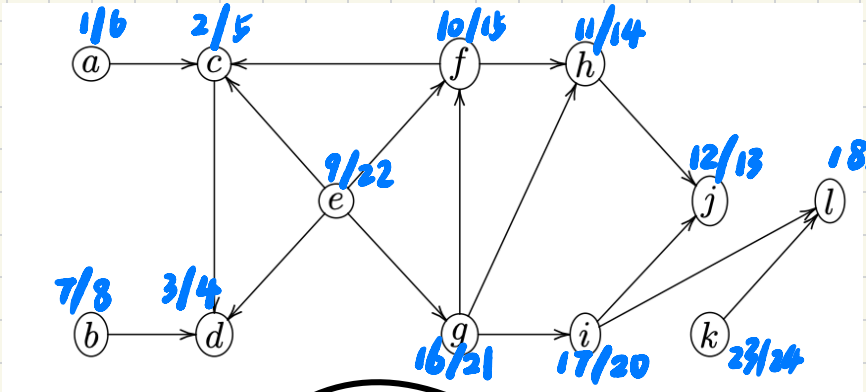
false, counter example :

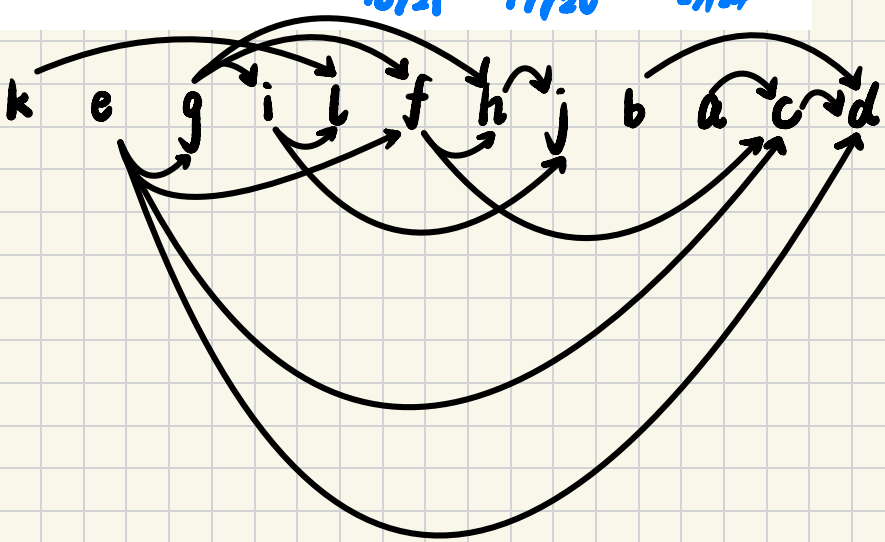


start from a : c → a is back edge

but start from b : a → b , a → c are back edges

Question 14.3





Question 14.4

```
DFS (G)
1: for each vertex u ∈ V do
2:     u.color = white
3: for each vertex u ∈ V do
4:     if u.color == white then
5:         if dfs-visit(G, u, NIL) == True then
6:             return true
7: return false
```

```
dfs-visit (G, u, parent)
1: u.color = grey
2: for each vertex v ∈ Adj[u] do
3:     if v.color == white then
4:         if dfs-visit (G, v, u) then
5:             return True
6:     else if v != parent then
7:         return True
8: u.color = black
9: return False
```

if $|E| > 2|V|$, there must be a vertex v that $deg(v) > 2$ then must exist back edge, leading to acyclic.

So if $|E| > 2|V|$ it's acyclic

if $|E| \leq 2|V|$ do DFS, running time $= O(|E|+|V|)$

$= O(3|V|) = O(|V|)$