1.

2 processes P1 and P2 & two semaphores A and B:

P1 Acquire A
P2 Acquire B
P1 Acquire B
P2 Acquire A

P1 Release A
P2 Release B
P1 Release B
P2 Release A

Deadlock occurs when:
Process 1 fails to acquire B since process 2 is running it

Process 2 fails to acquire A since process 1 is running it

2.

a. Cycle > Deadlock (False)
   It is possible to have a cycle with no deadlock. When there is more than one instance of a resource, a resource graph may contain a cycle but no deadlock.
b. Knot > Deadlock (True)
   A knot is a sufficient condition for a deadlock. A knot is a strongly connected subgraph of a directed graph, such that starting from any node in the subset, it is impossible to leave the knot by following the edges of the graph.

3. The need matrix is as follows:

	$\mathbf{R_0}$	$\mathbf{R_1}$	$\mathbf{R_2}$
$\mathbf{P_0}$	4	0	0
$\mathbf{P_1}$	1	1	3
$\mathbf{P_2}$	4	4	12
$\mathbf{P_3}$	0	1	3

Since P_1 only needs 1 more unit of R_1, a new request for 1 unit of resource R1 can be safely granted.