(1) Consider the sets \( P = \{P_1, P_2, P_3\} \) of three processes, \( R = \{R_1, R_2\} \) of resources, \( E = \{P_1 \rightarrow R_1, R_1 \rightarrow P_2, P_2 \rightarrow R_2, R_2 \rightarrow P_1, R_2 \rightarrow P_3\} \) of edges. Assume that there is one instance of \( R_1 \) and two instances of \( R_2 \).

(a) Draw the resource allocation graph.
(b) Assume that the process \( P_3 \) terminates and that its instance of \( R_2 \) is reallocated to \( P_2 \). Draw the new resource allocation graph after these changes have been made.
(c) Show that the sequence \( P_3, P_2, P_1 \) is a safe sequence.

(2) Consider a system in which there are there processes \( P_1, P_2, P_3 \) and resources \( R_1, R_2, R_3 \), each of which has one instance. Assume that there are assignment edges \( R_1 \rightarrow P_2, R_3 \rightarrow P_1 \); request edges \( P_3 \rightarrow R_3, P_1 \rightarrow R_1 \); and claim edges \( P_1 \rightarrow R_2, P_2 \rightarrow R_2, P_3 \rightarrow R_2 \).

(a) Draw the resource allocation graph, and use the resource allocation graph algorithm to show that the system is currently in a safe state.
(b) Consider the initial system state above. If \( R_2 \) is assigned to \( P_1 \), use the resource allocation graph algorithm to determine whether the system is in a safe state.
(c) Consider the initial system state above. If \( R_2 \) is assigned to \( P_2 \), use the resource allocation graph algorithm to determine whether the system is in a safe state.
(d) Consider the initial system state above. If \( R_2 \) is assigned to \( P_3 \), use the resource allocation graph algorithm to determine whether the system is in a safe state.