The following exercises will be discussed on July 11th.

Exercise 9-1   **Bisimilarity of Sequential Processes**

Consider the following CCS definitions

$$P \triangleq a.P_1$$
$$P_1 \triangleq b.P + c.P$$
$$Q \triangleq a.Q_1$$
$$Q_1 \triangleq b.Q_2 + c.Q$$
$$Q_2 \triangleq a.Q_3$$
$$Q_3 \triangleq b.Q + c.Q_2 \ .$$

Show that $P \sim Q$ holds by giving

1. ... an appropriate strong bisimulation relation.

2. ... a winning strategy for the defender.

Solution:

1. $R := \{(P, Q), (P, Q_2), (P_1, Q_1), (P_1, Q_3)\}$.

2. In the tutorial.

Exercise 9-2   **Weak Bisimilarity**

Given the following labelled transition system:
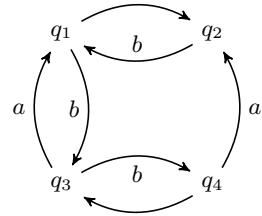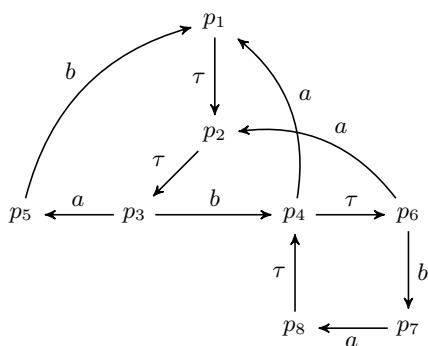
Show that $p_1 \not\approx q_1$.

Solution:

(p_1, q_1) A: $p_1 \xrightarrow{\tau} p_2$, D: $q_1 \Rightarrow_\tau q_1$

(p_2, q_1) A: $p_2 \xrightarrow{\tau} p_3$, D: $q_1 \Rightarrow_\tau q_1$

(p_3, q_1) A: $p_3 \xrightarrow{b} p_4$, D: $q_1 \Rightarrow_b q_3$

(q_3, p_4) A: $q_3 \xrightarrow{b} q_4$, D: $p_4 \Rightarrow_{\tau b} p_7$

- Case 1:

(q_4, p_7) A: $q_4 \xrightarrow{a} q_2$, D: $p_7 \Rightarrow_a p_8$

(p_8, q_2) A: $p_8 \xrightarrow{\tau} p_4$, D: $q_2 \Rightarrow_\tau q_2$

(p_4, q_2) A: $p_4 \xrightarrow{a} p_1$, D: $q_2 \Rightarrow_a \not\downarrow$

- Case 2:

(q_4, p_7) A: $q_4 \xrightarrow{a} q_2$, D: $p_7 \Rightarrow_{a\tau} p_4$

(p_4, q_2) A: $p_4 \xrightarrow{a} p_1$, D: $q_2 \Rightarrow_a \not\downarrow$

- Case 3:

(q_4, p_7) A: $q_4 \xrightarrow{a} q_2$, D: $p_7 \Rightarrow_{a\tau^2} p_6$

(p_6, q_2) A: $p_6 \xrightarrow{a} p_2$, D: $q_2 \Rightarrow_a \not\downarrow$