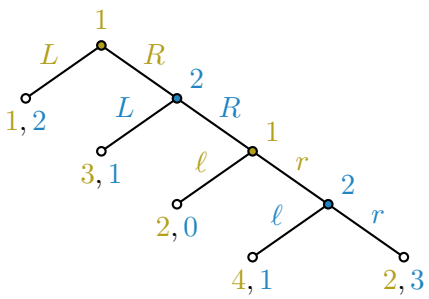
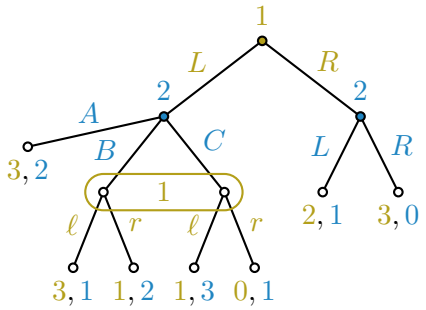
**ECON 7011, Semester 110.1, Assignment 3**

*Please hand in your solutions via NTU Cool before 11:59pm on Tuesday, December 7*

1. Consider the following two extensive-form games:




   (a) Find all subgame-perfect equilibria in the two games.

   (b) What assumptions on the players' knowledge of rationality and the correctness of their conjectures are both necessary and sufficient in the two games?

2. Consider the alternating-offers bargaining game with finite time horizon $T$, in which players $i = 1, 2$ negotiate over their share of a unit pie. In odd periods, Player 1 offers to split the pie according to $(x_1, 1 - x_1)$ and Player 2 decides whether to accept or reject the split (after observing $x_1$). In even periods, Player 2 offers to split the the pie according to $(1 - x_2, x_2)$ and Player 1 decides whether to accept or reject the split (after observing $x_2$). Suppose that both players' discount factors are $\delta < 1$ and that payoffs are $(0, 0)$ if no agreement is reached.

   (a) Draw the extensive-form game for $T = 2$.

   (b) Find the unique subgame-perfect equilibrium of the game.

   (c) Is it more valuable to have first-mover or last-mover advantage? Explain.

   (d) What assumptions on the players' knowledge of rationality and the correctness of their conjectures are both necessary and sufficient for the SPE in (b)?

3. Cameron and Drew recently stated dating and the first occasion for exchanging gifts is coming up. Choosing a gift of quality $q_i$ (measured in units of utility) costs time and effort $cq_i^2$ for a parameter $c > 0$. If the gifts are of unequal quality, both get a disutility of $|q_2 - q_1|$: neither wants to give a worse gift than they receive, but neither wants to receive a worse gift than they give either. The utility of individual $i$ from this gift exchange is $u_i(q) = q_{-i} - |q_2 - q_1| - cq_i^2$.

   (a) Suppose that the first gift exchange occurs on Christmas, where both simultaneously choose gifts. Find all pure-strategy Nash equilibria of this game.

   (b) Suppose that it is first Drew's birthday, then Cameron's birthday, before any mutual gift-exchange holidays. Find all pure-strategy subgame-perfect equilibria of this game.

   (c) How do the players' equilibrium utilities compare in these two scenarios? Explain.