EEP 100 — Problem Set 3 (Due Nov 24, 2009)

(1) (1 pt) Find the mixed-strategy equilibrium (percent of the time for each move) for Player 1 and Player 2 in this simultaneous move, one-shot game. (Hint: Think reaction functions).

Player 2

	Left	Right
Up	5,2	1,4
Down	2,5	3,2

Player 1

(2) (1 pt) Find the strategy for Player 1 and Player 2 (what moves to make) in this sequential move, one-shot game. Note that Nature moves after Player 1, going UP with a probability of 0.25 and DOWN with a probability of 0.75. Neither player knows Nature's move. Thus, Player 2 observes Player 1's move but does not know if Nature goes up or down.

Pr (U_N)= 0.25

U_2 2,3 / 5,5 / 2,3 / 0,0 / 3,3 / 0,5 / 2,4 / 1,5

U_1 D_1 D_2

Player 1 Nature Player 2
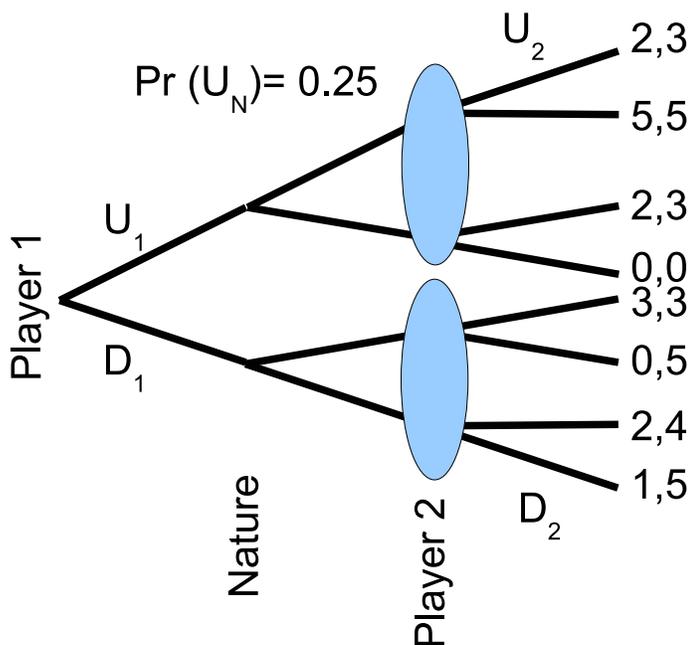
[NOTE: I did not label all branches with moves because there was no space, but your answer should be in the form of "Player 1 moves x; and Player 2 moves y" where x and y mean up or down.]

(3) (1.5 pts) Suppose there are two firms in an isolated market (no other entry) that produce identical beef. Firm 1s' marginal cost is $1 per lb of beef, and Firm 2's marginal cost is $2 per lb; there are no fixed costs. Suppose that each firm chooses its own output simultaneously without knowing its rival's choice (therefore this is a Cournot model). Market demand is $Q = 100 - 10P$.

(a) Find the reaction function for each firm, and draw them in a two-dimensional diagram with q_1 on the horizontal axis and q_2 on the vertical axis, where q_1 is Firm 1's output and q_2 is Firm 2's output.

(b) Find the equilibrium output for each firm using their reaction functions, and label equilibrium on your diagram from part (a).

(c) Find market price (P^*) and quantity (Q^*) in equilibrium.

(d) Compute each firm's equilibrium profit.

(4) (1.5 pts) Consider a market of beef with the same setup as in the previous question *except* that Firm 1 is a Stackelberg leader that chooses its own output (q_1) first. Firm 2 (the follower) observes this choice before choosing its output $(q_2$.

(a) Find Firm 1's optimal action and Firm 2's optimal response. Draw them in a two-dimensional diagram with q_1 on the horizontal axis and q_2 on the vertical axis.

(b) Find the equilibrium output for each firm, and label the equilibrium point in your diagram in part (a).

(c) Find market price (P^*) and quantity (Q^*) in equilibrium. Is the price higher or lower than in Question 3? What about total quantity?

(d) Compute the profit for each firm in equilibrium. Is Firm 1's profit higher or lower than Firm 1's profit in Question 3? What about Firm 2's profit?