Your Name: _____

The Ohio State University
Department of Economics
Second Midterm Examination

Econ 5001
Spring 2018
Prof. James Peck

Directions: *Answer all questions, show all work, and label all figures.*

1. (25 points) Consider the following Cournot game in which two firms simultaneously choose a non-negative output quantity. Let q_1 denote the quantity chosen by firm 1, let q_2 denote the quantity chosen by firm 2, and let Q denote the total quantity, $q_1 + q_2$. The market price is given by

$$p = \frac{1000}{Q}.$$

Each firm has a marginal production cost of 5 per unit of output. Notice that the demand function is not linear like the one presented in class.

(a) (5 points) Give the payoff functions for firm 1 and firm 2.

(b) (10 points) Find the best response function for firm 1. [In case you forgot from your calculus course, the rule for taking the derivative of a quotient is given below.]

(c) (10 points) Find the Nash equilibrium of this game. [Hint: Because the firms face the same market and have the same cost function, the NE will be symmetric, with $q_1 = q_2 = q^*$ for some q^*. Substitute this symmetry condition into the best response function from part (b) to get one equation in the unknown q^*.]

Here is the quotient rule. If $n(x)$ and $d(x)$ are functions of x, where $n'(x)$ and $d'(x)$ are the derivatives of these functions, then the derivative of the fraction, $n(x)/d(x)$ with respect to x is given by

$$\frac{d(x)n'(x) - n(x)d'(x)}{[d(x)]^2}.$$

2. (20 points) Consider the following variant of the election platform game. There are two players, candidate A and candidate B. Each candidate must choose a platform in policy space, represented by the "unit" interval between 0 and 1. The voters have ideal policy positions uniformly distributed over the unit interval. Candidate A has more charisma or personal charm than candidate B, which translates into the following voting behavior. If a voter's ideal position is x and the candidates' positions are s_A and s_B, then the voter votes for candidate B if the distance between x and s_A, minus the distance between x and s_B, is at least $\frac{1}{8}$. Otherwise, this voter will vote for candidate A. In other words, B must be "better" in policy terms than A by at least $\frac{1}{8}$ in order to receive the vote.

Assume that the candidates only care about the election outcome, and not about the policy they have to implement. If a candidate wins strictly more than half the votes, his/her payoff is 1; if a candidate wins exactly half the votes, his/her payoff is $\frac{1}{2}$; and if a candidate wins strictly less than half the votes, his/her payoff is 0.

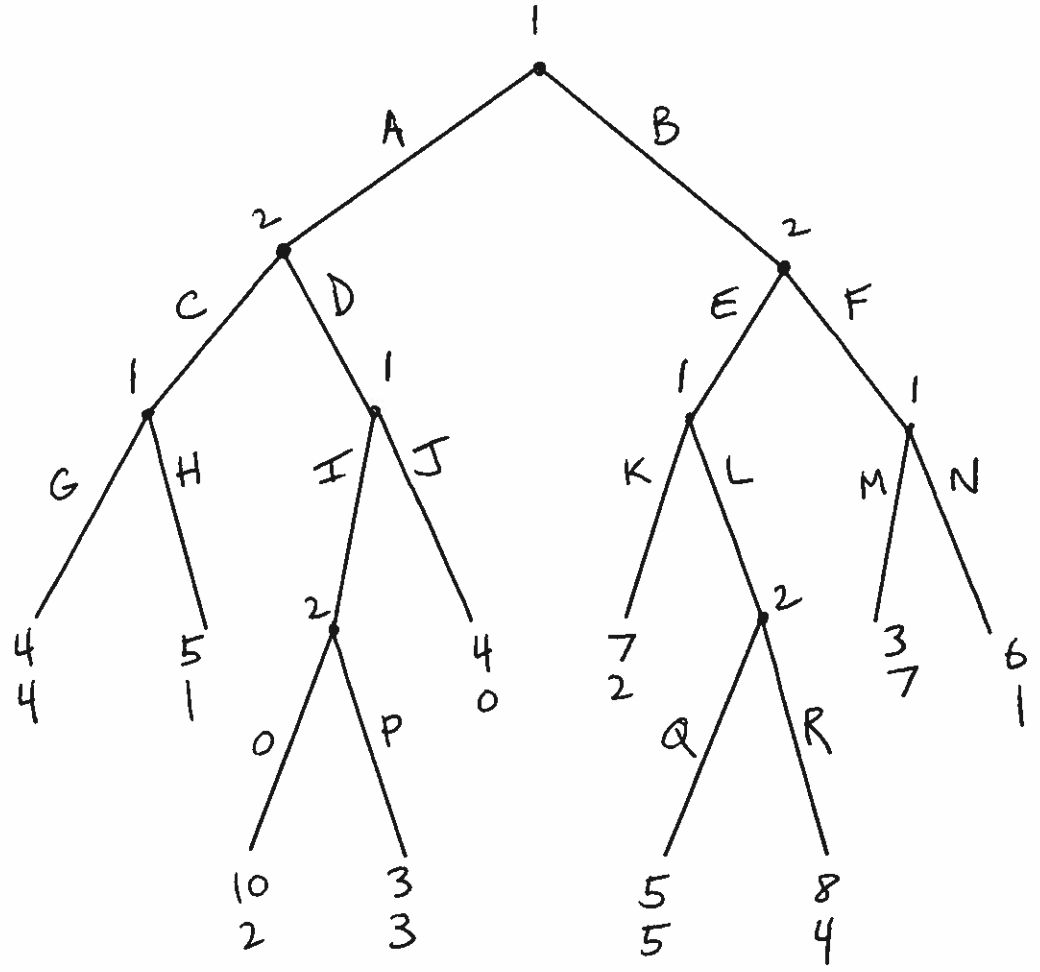
Find all of the pure-strategy Nash equilibria of this game.

3. (20 points) Consider the following game.

		player 2 L	player 2 R
player 1	U	16, 0	2, 6
	M	0, 8	12, 1
	D	10, 8	4, 8

Find the mixed strategy Nash equilibrium of this game, and show all your work.

4. (15 points) For the following game in extensive form, solve using backward induction, and indicate the equilibrium strategy profile here:



5. (20 points) Consider the following game in extensive form.

(a) (10 points) Find all of the Nash equilibria of this game.

(b) (15 points) Find all of the subgame perfect Nash equilibria of this game.