1. Alan Apple and Betsy Banana consume apples (good 1) and bananas (good 2). Alan has an endowment of only apples $\omega_1^A = 20$,$\omega_2^A = 0$. Betsy has an endowment of only bananas $\omega_1^B = 0, \omega_2^B = 20$.

A) Write down Alan and Betsy's budget equations.

B) Alan's utility is Cobb Douglass: $u(x_1, x_2) = x_1 x_2$. What is his demand?

C) Betsy's has perfect complements preferences $u(x_1, x_2) = min\{x_1, x_2\}$. What is her demand?

D) Suppose $p_1 = 1$ and $p_2 = 2$. What are the consumer's demands?

E) Is $p_1 = 1$ and $p_2 = 2$ an equilibrium?

F) Assume $p_1 = 1$. What must p_2 be in equilibrium?

2. Alan Apple and Betsy Banana consume apples (good 1) and bananas (good 2). Alan has an endowment of only apples $\omega_1^A = 20$,$\omega_2^A = 0$. Betsy has an endowment of only bananas $\omega_1^B = 0, \omega_2^B = 30$.

A) Alan's utility is Cobb Douglass: $u(x_1, x_2) = x_1 x_2$. What is his demand?

B) Betsy's utility is Cobb Douglass with different exponents: $u(x_1, x_2) = x_1^2 x_2^1$. What is her demand?

C) Assume $p_1 = 1$. What must p_2 be in equilibrium?

3. A community shares an orchard. The number of apples picked depends on the number of workers picking apples N. $A = 20(N)^{\frac{3}{4}}$. The number of apples picked by each worker is $\frac{20(N)^{\frac{3}{4}}}{N}$. Apples can be sold for \$1 each. In order to pick apples, workers must pay \$5 in costs to get supplies like buckets and stuff.

A) If $N = 16$ how many apples does each worker pick? Are these workers better off than if they did not pick apples?

B) If $N = 10000$? Are these workers better off than if they did not pick apples?

C) What is the number of workers that will choose to work? (Hint: find the N such that they amount each earns is \$5 so that no additional workers have incentive to enter.)

D) What is the socially optimal number of workers? (The number of workers that maximizes the total profit earned by the workers collectively.)

E) What permit fee could the government charge to get the number of workers that enter to be equal to the social optimum?

4. The community of East Nashville is home to 10000 people. These people do two things. They go to brunch and they take their dogs to a dog park. Each has income of 100000. Their utility functions are composed of how much brunch they can buy b_i and how nice the dog park is D. Their utility functions are $u(b_i, D) = b_i + 10000ln(D)$. How nice the dog park is D is determined by the sum of money contributions of each individual to the park. These are given by d_i and $D = \sum_{i=1}^{10000}(d_i)$. Assume that these consumers choose d_i and spend the rest of their money on brunch.

A) Write each individual's utility in terms of only d_i and $D_{-i} = D - d_i$.

B) How much does each individual contribute to the dog park in a symmetric Nash equilibrium?

C) If the government wants to force individuals to contribute d instead of having them choose what to contribute, what should they choose to maximize joint utility?

5. Suppose there are two firms with cost functions $c(q) = 2q$ and inverse demand of $p(Q) = 100 - Q$.

A) What is firm 1's profit function in terms of q_1 (quantity set by firm 1) and q_2 (quantity set by firm 2)

B) What are the best response functions of the two firms?

C) What is the symmetric Nash equilibrium of this cournot game?