YOUR NAME

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YOUR STUDENT ID NUMBER

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You have 100 minutes to solve the following 3 exercises (for 20 + 2 points).

To get 100% on this exam, you need to collect 20 points. The questions on the last page (2 points) are for extra credit.

All exercises require some justification. You will not get full score unless you show your working and briefly justify each of your answers.

Please read all the questions very carefully.

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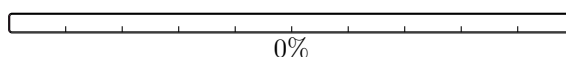
1. Suppose that the inverse demand curve for a *very mysterious good* is given by $P = 20 - 0.5 \cdot Q$, where P is the price and Q is the total industry output.

Suppose that the industry has <u>two firms</u>. One firm has a constant marginal cost of \$1 per unit of output, while the other firm has a constant marginal cost of \$3 per unit of output. If the two firms compete à la <u>Cournot</u>, how much output will each firm produce? How much will the unit price of this *very mysterious good* be?

3 points

15%
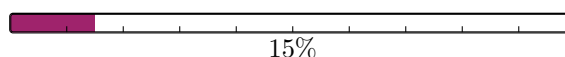
2. An airport is located next to a housing development. Where X is the number of planes that land per day and Y is the number of houses in the housing development, profits of the airport are $36X - X^2$ and profits of the developer are $42Y - Y^2 - XY$. For simplicity, X and Y are expressed in 10s of units (i.e., 10s of planes and houses, respectively), while profits are to be interpreted in 1000s of monetary units.

(a) How many houses are going to be built and how many planes are going to land if a single profit-maximizing company owns the airport and the housing development?
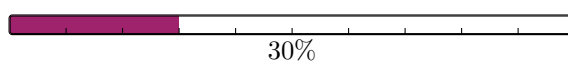
1 points

(b) How many houses are going to be built and how many planes are going to land if the airport and the housing development are operated independently?

1 point

25%
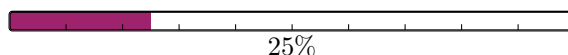
(c) How should the social planner <u>tax or subsidize</u> the airport's activity so that it produces the socially-optimal level of output.
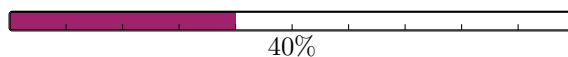
1 point

30%

3. Consider a <u>pure exchange economy</u> with two consumers (let's say, *Attila* and *Balázs*) and two goods (let's say, *exes* and *whys*):

- $u_A(x_A, y_A) = x_A^{\frac{1}{2}} y_A^{\frac{1}{2}}$,

- $u_B(x_B, y_B) = x_B + 4y_B$,

- Agent A initially owns 10 units of *exes* and 1 unit of *whys*: $\omega_A^x = 10$, $\omega_A^y = 1$.

- Agent B initially owns 10 units of *exes* and 4 units of *whys*: $\omega_B^x = 10$, $\omega_B^y = 4$.

(a) Represent this pure exchange economy with the help of an Edgeworth box (a sketch will suffice!), and find (mathematically) the <u>contract curve</u>.

2 points

40%

(b) Find (mathematically) and represent graphically the <u>utility possibilities set</u> for this pure exchange economy.

2 points

50%

(c) Assume that the two consumers are allowed and able to trade with each other, and that *exes* are the numeraire. Also assume that both consumers act as price-takers.

    i. Find the competitive equilibrium of this pure exchange economy. In other words, find the equilibrium price of *whys*.
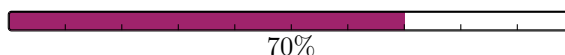
2 points

    ii. Find the allocation of *exes* and *whys* in the competitive equilibrium.

1 point

    iii. Is the allocation of *exes* and *whys* in the competitive equilibrium Pareto efficient? (Hint: Check whether it is located on the contract curve or not.)
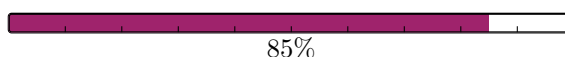
1 point

70%

    iv. Represent the competitive equilibrium in an Edgeworth box. A sketch will suffice as long as it shows the initial endowment, the consumers' budget constraint, the equilibrium allocation, and the indifference curves going through the equilibrium allocation.

<div align="right">1 point</div>

(d) The social planner looking over this pure exchange economy would like to maximize the following social welfare function: $SWF(u_A, u_B) = \min\{4u_A, u_B\}$.

    i. Find the allocation in the utility possibilities set for this pure exchange economy that maximizes the social welfare function.

<div align="right">2 points</div>

<div align="center">85%</div>

ii. How should the social planner rearrange the initial endowment of *exes* (*exes* only!) so that this pure exchange economy reaches the allocation that maximizes the social welfare function through the two consumers trading with each other?

2 points

iii. Represent the new competitive equilibrium (after the social planner has rearranged the initial allocation) in an Edgeworth box. A sketch will suffice as long as it shows the original and the rearranged initial endowments, the consumers' budget constraint, the equilibrium allocation, and the indifference curves going through the equilibrium allocation.

1 point
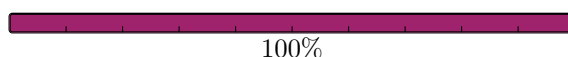
100%

You have reached the end of the exam.

100%
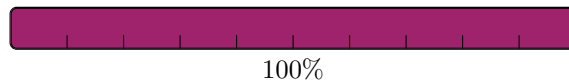
In case you have some extra time, consider the remaining questions for extra credit.

(e) Assume that the two consumers are allowed and able to trade with each other, and that *exes* is the numeraire. Also assume that Balázs has market power and acts as price-maker, while Attila acts as price-taker. Use the *original* initial endowment when answering this question.

  i. Find the equilibrium of this pure exchange economy. In other words, find the price that Balázs would set for *whys*.
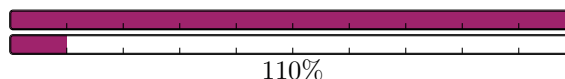
  1 point

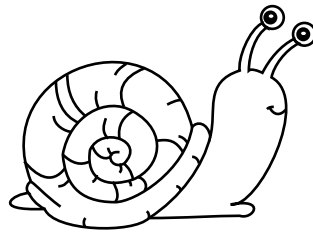 ii. Find the allocation of *exes* and *whys* in this equilibrium.

  0.5 points

  iii. Is the allocation of *exes* and *whys* in this equilibrium Pareto efficient? (Hint: Check whether it is located on the contract curve or not.)

  0.5 points

110%

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until instructed to do so.