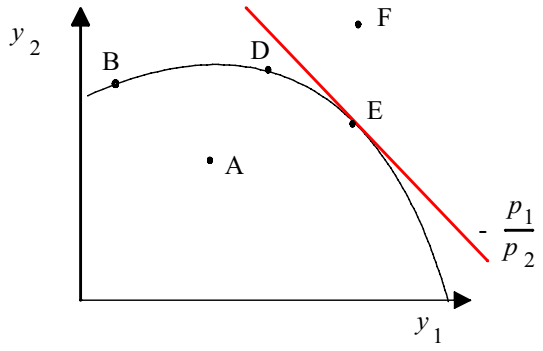
ECN 371: Exercise set 1

Exercise sets are not to be handed in. At the same time as exercises are put on the WEB page, so are the associated suggestions for answers.

1. Consider the production possibility set bordered by the product transformation curve, and the two products y_1 and y_2, given a fixed resource base, R.



   a. The points, A, B, D, E, and F in the above figure shows various production amounts for the goods y_1 and y_2. Which of the points are:

      (i) Technically feasible (is it possible to produce the shown amount)?

      (ii) Technically efficient?

      (iii) Economically efficient?

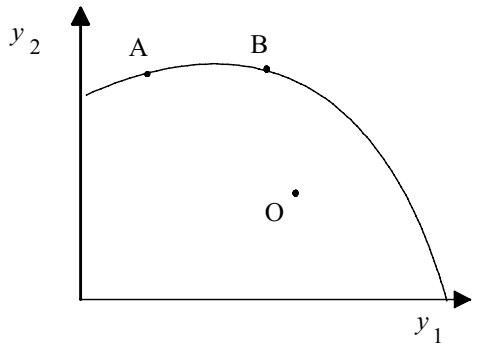
      Justify your answer.

   b. Double the price of y_1. How does that affect the economic efficient quantities to be produced of the two goods, y_1 and y_2? Justify your answer using the appropriate graphics.

2. Consider the following graph displaying the possible total wealth in an economy of two persions, 1 and 2. Let O = $\{y_1^0, y_2^0\}$ denote the initial allocation of wealth. Both individuals have utility functions that are linear in wealth (for simplicity reasons).

   Assumptions:

   - to get to any new allocation, both individuals have to agree on the new allocation
   - all changes in allocation are "one-shot", i.e., no repeated games etc.
   - utility functions are self regarding, i.e. there is lack of envy or altruism.



a. Why is the allocation O not economically efficient?

b. Draw the region of Pareto improvements given the initial allocation O.

c. Given the initial allocation O and starting assumptions, why would we never observe the allocation A?

d. Show how it is possible to end up in allocation B given the initial allocation O. What is needed for this to take place?

e. Is allocation B a likely outcome? Justify you answer.

3. A firm has the following total cost function in output space $c(y) = a\,y + b\,y^2$

where y is the amount produced and a and b are positive.

a. Write down the firm's profit function

b. Show that the firm's profit maximizing output is $y^* = \frac{p - a}{2\,b}$. Calculate the firm's profits.

c. Let $a = 1$, $b = 0.25$, and $p = 4$. Then draw the firm's marginal revenue (MR) function and marginal cost (MC) function in the same graph. From your graph, what appears to be the profit maximizing production level, y^*.

d. The firms emissions, z, is connected to output by the following function: $z(y) = \frac{1}{2}y^2$. Assume that emissions are taxed with the tax rate t per unit of emissions. Write down the firms revised profit function in terms of the parameters (a and b), the product price (p), the emission tax (t), and output y.

e. Show that the optimal production amount now becomes $y^{**} = \frac{p - a}{2\,b + t}$.

f. Use the parameter values from part c, and let the tax rate, $t = 0.5$. Find the firms profit maximizing output level and profits.

h. Show how you would do part f graphically.

i. Assume that instead of the emission tax, the firm cannot emit more than 12.5 units of z, i.e. $z \leq 12.5$. Find the firm's optimal output and profits.

j. Assume that the emission level is relaxed, and the firm is allowed to emit 24 units of z, i.e. $z \leq 24$. Find the firm's optimal output, emission level and profits. Why are profits the same as in part c when parameter values and prices are inserted?