This assignment is based on Chapter 14 of Kolstad and the lecture notes from class

Problem 1: Chapter 14 Question 6, page 301

Problem 2: Consider the following pollution offset problem:

There are two firms, each emitting 20 units of emissions, which meets the standard set by the old CAC regulation. The government has decided to replace the CAC with a pollution offset program. There are two receptors in the region and, at the current emissions, both read 120 on the pollution index. 120 is the maximum allowed at either receptor under the new program.

When the two firms increase their emissions, their total savings is given by the following functions

$TS_1 = ln(e_1)$ and $TS_2 = 2ln(e_2)$ {where ln is the natural logarithm)

The marginal cost functions are, respectively, are **$MS_1 = 1/e_1$** and **$MS_2 = 2/e_2$**

At receptor Station One, the diffusion coefficients are $a_{11} = 4$ and $a_{12} = 2$. Therefore, at Station One, the emission constraint is: **$4e_1 + 2e_2 = 120$**

a) Determine the cost minimizing levels of emissions at Station.

At the second receptor, Station Two, the diffusion coefficients are $a_{21}= 3$ and $a_{22} = 3$; with a target ambience of 120.

b) Use the same approach as in part (a) to determine the cost minimizing level of emissions that satisfy Station Two.

c) Carefully graph both constraints on a graph with e1 on the horizontal axis and e2 on the vertical axis. Indicate the region that satisfies both constraints.

d) Label the solutions to (a) and (b) on your graph. Can you determine if each violates the other constraint? Is there a solution where both constraints are satisfied? If so, which receptor has the binding constraint?

e) Suppose the government had initially granted 20 emission permits to each firm: Given the information in your answers for (a) to (d), determine who will sell permits and who will buy permits. What will be the price ratio of the permits that are traded?