# QUIZ 2, PUBLIC GOODS REVISITED

**Part 1. Consider the same problem we saw on lecture, Sam and Ryan are roomates. They have one day to spend between cleaning and leisure. Cleaning produces a public good, $C = C_S + C_R$, Assume the utililities are given by $U_i = ln(L_i) + ln(C)$. What is the budget constraint in this problem for each guy?**

$C_R + L_S = 1$ and $C_R + L_R = 1$

**Part 2. Substitute $C = C_S + C_R$, in the utility function, but do not substitute the budget constraint. Use instead the method that we covered in discussion ( Marginal rate of Substitution equals price relationship) to find the best responses, and then the Nash equilibrium.**

$U_s = ln(L_s) + ln(C_s + C_R)$, then $MRS_S = \frac{L_S}{C_s + C_R} = 1$, thus $L_s = C_s + C_R$, using the budget line, $2C_S + C_R = 1$, thus $C_S = \frac{1 - C_R}{2}$, By symmetry $C_R = \frac{1 - C_S}{2}$. Thus the Nash Eq $C_S = 1/3$ and $C_R = 1/3$

**Part 3. Find the efficient quantity of cleaning, (hint: we did this several times las discussion)**

Here we need to add the marginal rate of substitutions $SMRS = \frac{Ls + L_R}{C}$, and $SMRS = 1$, thus $L_S = C - L_R$, Hence adding the budget lines, $L_S + L_R + C = 2$, thus $C = 1$

**Part 4. $\Sigma_{t=0}^{\infty} \frac{A}{\beta^t}$ =?**

Remmember that $S = A + \frac{A}{\beta} + \frac{A}{\beta^2}...$ thus $\frac{S}{\beta} = \frac{A}{\beta} + \frac{A}{\beta^2}....$ Therefore $S - \frac{S}{\beta} = A$, or $S = \frac{A}{1 - \frac{1}{\beta}}$