Exercises from L10 (SR1)

Question 1

a) USL is from parallel processing systems

$$R(N) = C \frac{N}{1 + \alpha(N-1) + \beta N(N-1)}$$

where R is the performance measure (is a scaler
N is number of processes/agents
α is contention (limited resources)
β is coherency (lack of communication)

b) $C = 1, \alpha = \beta = 0 \Rightarrow$ linear speedup

c) $C = 1, \alpha = 10^{-4}, \beta = 0 \Rightarrow$ sub linear speedup

d) $C = 1, \alpha = 7 \cdot 10^{-4}, \beta = 3 \cdot 10^{-4} \Rightarrow$ Decrease

e) $C = 0{,}25, \alpha = -0{,}0335, \beta = 0{,}00032$

$\Rightarrow$ Sub, Super, optimal, diference region

$\Rightarrow$ Optimal performance at $N \sim 57$

f) $R - L > 0$ for interval $N \in [34, 71]$
with optimum at $N \sim 57$

g) $R' - L' > 0$ for interval $N \in [22, 55]$
with peak at $N \approx 48$

b) - When N is unlimited

$$\frac{dR}{dN} = 0 \Rightarrow \text{max performance level}$$

$N \approx 57$

- when N is limited and expect a constant probability of loss / robot

$$\frac{d\left(\frac{R}{N}\right)}{dN} = 0 \Rightarrow \text{optimal performance level}$$

$N \approx 53$