Submission for Apoorv Malik and Marco Lagos
A3 Q1.1

$$L_R = \sum_{k=1}^{C} L(\alpha_{C+1} \mid y=k) P(y=k \mid x)$$
$$= \lambda_R \sum_{k=1}^{C} P(y=k \mid x)$$
$$= \lambda_R$$

If we set $y = j$

$$L_j = \sum_{k=1}^{C} L(\alpha_i \mid y=k) P(y=k \mid x)$$
$$= P(y=j \mid x) \sum_{k=1}^{C} \lambda_S P(y=k \mid x)$$
$$= \lambda_S \left(1 - P(y=j \mid x)\right)$$

If $P(y=j \mid x) \geq 1 - \frac{\lambda_R}{\lambda_S}$

$$L_j \leq \lambda_S \left(1 - \left(1 - \frac{\lambda_R}{\lambda_S}\right)\right)$$

$$= \lambda_R$$
$$= L_R$$