Q4. Explain how the following can be optimized with linear progs

$$\max \frac{x_1 + 2x_2 + 3x_3 + \dots + n x_n}{\sum_{i=1}^{n} x_i}$$

s.t. $\sum_{i=1}^{n} x_i > 0$

$\sum_{j=1}^{n} a_{ij} x_j \geq 0 \quad \forall i = 1 \dots m$

$x_i \geq 0 \quad \forall i = 1 \dots n$

set $Z = \frac{1}{\sum_{i=1}^{n} x_i}$ and variables $y_1 \dots y_n$ st $y_j = x_j Z \ \forall j\ 1 \dots n$

$\max\ y_1 + 2y_2 + 3y_3 \dots n y_n$

s.t. (1) $\frac{y_1 \dots y_n}{Z} > 0$

(2) $\frac{1}{Z} \sum_{j=1}^{n} a_{ij} y_j \geq 0 \quad \forall i = 1 \dots m, \forall j = 1 \dots n$

(3) $\frac{y_j}{Z} \geq 0 \quad \forall j = 1 \dots n$

(4) $Z > 0$

Simplex can now be run on this