Exercise 3

a) 1) The formula for the price of the 3 securities is as follows:

$$\text{Price}(0) = \sum_{i=1}^{n} c_i P(0,T_i) + N P(0,T_n)$$

$$= \sum_{i=1}^{n} c_i e^{-y(0,T_i)T_i} + N e^{-y(0,T_n)T_n}$$

A simple numerical application (Jupyter) yields:

Portfolio $(0) \cong 254.41$
Bond 1 $(0) \cong 92.18$
Bond 2 $(0) \cong 129.51$

2) The duration of the 3 securities given by

$$D(0) = \sum_{i=1}^{n} \frac{c_i P(0,T_i) T_i}{\text{Price}(0)}$$

A simple numerical application (Jupyter) gives:

Portfolio_duration $(0) \cong 5.761$
Bond 1_duration $(0) \cong 6.212$
Bond 2_duration $(0) \cong 6.160$