Exercise 5.3

1. Calculate the future value of 36 monthly instalments of €20.00 at an interest rate of 0.5% per month. What is the total interest earned on these savings?

$A = P(1+i)^t$

MER = 0.5% = 0.005

geometric series = $20(1.005)^{36} + 20(1.005)^{35} + \ldots + 20(1.005)^1$

$T_{36} + T_{35} \ldots T_1$

$S_n = \frac{a(1-r^n)}{1-r}$

$T_1 = a = 20(1.005)^1 = 20.1$

$r = 1.005$ (Common Ratio)

$n = 36$

$S_{36} = \frac{20.1\,(1 - 1.005^{36})}{1 - 1.005}$

$= €790.66$

Example 3

What amount of money is needed now to provide a pension of €25 000 a year for 20 years, assuming an AER of 4%?

$A = P(1+i)^t$

$\Rightarrow P = \frac{A}{(1+i)^t}$

We want to calculate a set of principals that each amount to €25000 after amounts of time.

Geometric Series: Total = $\frac{25000}{(1.04)^{20}} + \frac{25000}{(1.04)^{19}} + \ldots + \frac{25000}{(1.04)^1}$

T_{20} $\xrightarrow{\times \frac{1}{1.04}}$ T_{19} T_1

$a = T_1$

$a = 25000 / 1.04 = 24038.46$

Ratio: $r = \frac{T_2}{T_1}$

$r = \frac{1}{1.04}$

$S_n = \frac{a(1-r^n)}{1-r}$

$S_{20} = \frac{24038.46\left(1 - \left(\frac{1}{1.04}\right)^{20}\right)}{1 - (1/1.04)}$

$= €339{,}758.16$