Name:
Result:

1. *(2 points)*

Maria invests 60 000 PLN into an account that pays $r\%$ annual interest rate compounded quarterly. After 3 years the investment will be worth 67 609.50 PLN.

(a) Find the value of r.

(b) Maria wants to have 100 000 PLN in the account, calculate how long it will take her to reach this target.

2. *(3 points)*

Tomasz takes a loan of 100 000 PLN in order to purchase new Toyota Prius. The interest on the loan is 9% compounded monthly and the loan is to be repaid in 15 years.

(a) Calculate the monthly repayments.

(b) Calculate the total **interest** paid by Tomasz.

3. *(4 points)*

Tomasz runs the first 400 metre lap in 60 seconds. He runs each subsequent lap 8 seconds longer than the previous one.

(a) Find the time it takes Tomasz to run:

(i) the fifth lap,

(ii) five laps.

Maria runs the first lap in 50 seconds and each subsequent lap 10% longer than the previous one.

(b) It takes Maria to run the k-th lap longer than Tomasz. Find the least possible value of k.

(c) It takes Maria to run m laps longer than Tomasz. Find the least possible value of m.

4. *(4 points)*

The third, fourth and fifth terms of an infinite geometric sequence are given by $3x+1$, $x+2$ and $\dfrac{2x-1}{2}$. Given that the sum to infinity of this sequence exists, find x and the least value of n for which:

$$S_\infty - S_n < \frac{1}{100}$$

where S_n denotes the sum of the first n terms of this sequence.

5. *(3 points)*

Tomasz invests x into an account that pays an annual interest rate of 4% compounded yearly. At the end of each year, after the interest is added, Tomasz invests another y into the account.

(a) Write down the expression for the amount of money in the Tomasz's account after 2 years in terms of x and y.

(b) Show that the formula for the amount of money in Tomasz's account after n years is:

$$FV(n) = x \cdot 1.04^n + 25y \cdot (1.04^n - 1)$$

(c) Hence, or otherwise, find the amount of money in the account after 10 years, if Tomasz initially invested 120 000 PLN and added another 20 000 PLN at the end of each year.