

Exercise 1

Calc. : ✓

Miriam has saved €6000 and uses some of this money to buy a new phone. The price of the phone is increased by 18% when the purchase includes an optional insurance policy. The cost is €756.38 with the insurance policy.

a) **Calculate** how much the phone cost *without* the insurance policy.

3 marks

Miriam places €5250 in a new savings account that pays 3% interest each year. She makes no further withdrawals or deposits to this account.

The amount of money in her account at the end of each year is calculated using the formula

$$y = 5250 \times (1.03)^t$$

where t is the number of years and y is the amount of money in her account.

b) **Complete** the table and use this to **state** how many years will pass until she has at least €6000 in her account.

5 marks

t	0	1	2	3	4	5
y						

Exercise 2

Calc. : ✓

A set of vectors is given by

$$\vec{a} = \begin{pmatrix} 5 \\ 1 \end{pmatrix}, \quad \vec{b} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

a) **Determine** if the vectors are linearly independent. **Show** your working.

3 marks

b) Does the set form a basis of \mathbb{R}^2 ? **Explain** your answer.

3 marks

c) If possible, **express** the vector $\vec{u} = \begin{pmatrix} 7 \\ 0 \end{pmatrix}$ as a linear combination of \vec{a} and \vec{b} .

3 marks

Exercise 3

Calc. : ✓

A trigonometric function is given by

$$y = \frac{\pi}{3} \sin\left(\frac{\pi}{2}x\right) - 3.5$$

a) **Find** the amplitude, period and principal axis.

2 marks

b) **Find** the intersection with the y-axis.

2 marks

c) **Transform** the given function such that the period is $\frac{3\pi}{2}$.

3 marks

Exercise 4

Calc. : ✓

The following equations are used to calculate a potential energy V and a force F .

$$V = \frac{k2q}{r} \quad F = \frac{kq^2}{r^2}$$

where t is the time in months.

a) **Use** $k = 9 \times 10^9$, $q = 1.6 \times 10^{-19}$ and $r = 2.1 \times 10^{-10}$ to calculate V and F , giving your answers to an accuracy of 2 significant figures.

6 marks

b) If the value of r was increased, would V be larger or smaller? **Justify** your answer.

2 marks