Exercise 1 Calc. : ✓

Consider the function $f(x) = x^3 - 4x^2 + x + 2$.

1. Determine the coordinates of the turning points of $f(x)$, giving your answer to 2 decimal places. — 4 marks
2. Draw a table of signs. — 2 marks
3. Use the table of signs to determine the nature of the turning points. — 2 marks

Exercise 2 Calc. : ✓

Consider the function $f(x) = \dfrac{6x+5}{3x-4}$.

1. Explain why the function is undefined when $x = 1\dfrac{1}{3}$. — 1 mark
2. State the domain of the function. — 2 marks
3. Give the coordinates of the y-intercept of $f(x)$. — 2 marks

Exercise 3 Calc. : ✓

Karen plays volleyball and throws a ball vertically. The height $h(t)$ (in meters) as a function of the time t (in second) of the ball is given by the formula: $h(t) = 6t - 5t^2 + 2$.

1. From what height does Karen throw the ball? — 2 marks
2. Show that the ball reaches its highest point at $t = 0.6$ s. — 3 marks
3. Calculate the ball's maximum height. — 3 marks
4. For how long is the ball in the air? — 3 marks

Exercise 4 Calc. : ✓

A group of scientists decides to investigate a population of insects in a large field. It is found that the starting population 100 and that the population increases exponentially by 20% every week. Two students each write down a formula to model the population P at a time t, where t is the number of days since the start of the investigation:
Formula A: $P(t) = 100t + 1.2$
Formula B: $P(t) = 100 \cdot (1.2)^t$

1. Explain why formula B is the correct formula and why formula A is incorrect. — 2 marks
2. Calculate the number of insects after 2 weeks, to the nearest whole number. — 2 marks
3. Copy and complete the table of values below, giving your answers to the nearest whole number: — 2 marks

Number of days	**5**	**10**	**15**	**20**
Population				

4. After how many days will the population exceed 4 600? — 2 marks

Another group of scientists investigates a population of insects in a different large field. They record their results in the table below:

Number of days	**0**	**5**	**10**	**15**	**20**
Population	**100**	**340**	**580**	**820**	**1 060**

5. Explain why the results follow a **linear** model. — 1 mark
6. Use the information in the table of values to write down a formula to model the population P at a time t, where t is the number of days since the start of the investigation. — 2 marks