

Exercise 1

Calc. : ✓

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

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| 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 $f(x) = \frac{6x + 5}{3x - 4}$.

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| 1. Explain why the function is undefined when $x = 1\frac{1}{3}$. | 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: $h(t) = 6t - 5t^2 + 2$.

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| 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: $P(t) = 100 \cdot (1.2)^t$

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| 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				

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

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| 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 |