

**S6MA3ENA – Semestre 1**

**MATHEMATICS 3**

**Part B**

**Date:** Wednesday 15th December 2021

**DURATION OF EXAMINATION:**

45 minutes

**Answer ALL questions**





K. Osborne

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| **PART A** | **Marks** |
| 1. Consider the function $f\left(x\right)=x^{3}-4x^{2}+x+2$.
2. Determine the coordinates of the turning points of $ f\left(x\right)$, giving your answer to 2 decimal places.
3. Draw a table of signs.
4. Use the table of signs to determine the nature of the turning points.
 | 422 |
| 1. Consider the function $f\left(x\right)=\frac{6x+5}{3x-4}$.
2. Explain why the function is undefined when $x=1\frac{1}{3}$.
3. State the domain of the function.
4. Give the coordinates of the $y$-intercept of $ f\left(x\right)$.
 | 122 |
| 1. 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: $h\left(t\right)=6t-5t^{2}+2$.
2. From what height does Karen throw the ball?
3. Show that the ball reaches its highest point at $t=0.6$ s.
4. Calculate the ball`s maximum height.
5. For how long is the ball in the air?
 | 2333 |
| 1. 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: $P\left(t\right)=100t+1.2$Formula B: $P\left(t\right)=100∙(1.2)^{t}$1. Explain why formula B is the correct formula and why formula A is incorrect.
2. Calculate the number of insects after 2 weeks, to the nearest whole number.
3. Copy and complete the table of values below, giving your answers to the nearest whole number:

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

1. After how many days will the population exceed 4600?

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** | **1060** |

1. Explain why the results follow a **linear** model.
2. 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.
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