



S5MA6ENA

EXAMINATION DATE: 29TH NOVEMBER

EXAMINATION TIMES: 8.30-09.15

TEACHERS: MS EGHOLM AND MR SEARLE

NAME OF STUDENT:

FORMAT:

There are 4 questions in this booklet.

There are a total of 33 marks available.

Please write your answers in this booklet

DURATION OF THE EXAMINATION:

45 minutes

AUTHORIZED MATERIAL:

Pencil and Ruler for graphs

Graphic calculator in exam mode

NOTE

- Answers must be supported by explanations that show the reasoning behind the results or solutions provided.
- If graphs are used to find a solution, they must be sketched as part of the answer.
- Unless indicated otherwise, full marks will not be awarded if a correct answer is not accompanied by supporting evidence or explanations of how the results or the solutions have been achieved.
- When the answer provided is not the correct one, some marks can still be awarded if it is shown that an appropriate method and/or a correct approach has been used.

Stay calm and believe in yourself!

| Question 1 | Exponentials | | | | | | | | | | | | | | |
|----------------|---|-----|---|---|---|---|---|---|-----|--|--|--|--|--|--|
| <p>3 marks</p> | <p>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.</p> <p>a) Calculate how much the phone cost <i>without</i> the insurance policy.</p> <p>Answer:</p> <p>Miriam places €5250 in a new savings account that pays 3% interest each year. She makes no further withdrawals or deposits to this account.</p> <p>The amount of money in her account at the end of each year is calculated using the formula</p> $y = 5250 \times (1.03)^t$ <p>where t is the number of years and y is the amount of money in her account.</p> <p>b) Complete the table and use this to state how many years will pass until she has at least €6000 in her account.</p> <table border="1"> <thead> <tr> <th>t</th> <th>0</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> </tr> </thead> <tbody> <tr> <td>y</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Answer:</p> | t | 0 | 1 | 2 | 3 | 4 | 5 | y | | | | | | |
| t | 0 | 1 | 2 | 3 | 4 | 5 | | | | | | | | | |
| y | | | | | | | | | | | | | | | |
| <p>5 marks</p> | | | | | | | | | | | | | | | |

| Question 2 | Vectors |
|------------|--|
| 3 marks | <p>A set of vectors is given by</p> $\vec{a} = \begin{pmatrix} 5 \\ 1 \end{pmatrix}, \quad \vec{b} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ <p>a) Determine if the vectors are linearly independent. Show your working.</p> <p>Answer:</p> |
| 3 marks | <p>b) Does the set form a basis of R^2? Explain your answer.</p> <p>Answer:</p> |

| | |
|---------|--|
| 3 marks | <p>c) If possible, express the vector, $\vec{u} = \begin{pmatrix} 7 \\ 0 \end{pmatrix}$, as a linear combination of \vec{a} and \vec{b}.</p> <p>Answer:</p> |
|---------|--|

| Question 3 | Trigonometric functions |
|------------|---|
| 2 marks | <p>A trigonometric function is given by</p> $y = \frac{\pi}{3} \sin\left(\frac{\pi}{2}x\right) - 3.5$ <p>a) Find the amplitude, period and principal axis.</p> <p>Answer:</p> |
| 2 marks | <p>b) Find the intersection with the y-axis.</p> <p>Answer:</p> |
| 3 marks | <p>c) Transform the given function such that the period is $\frac{3\pi}{2}$.</p> <p>Answer:</p> |

| Question 4 | Standard index form |
|------------|--|
| 3+3 marks | <p>The following equations are used to calculate a potential energy V and a force F.</p> $V = \frac{k q^2}{r} \quad F = \frac{k q^2}{r^2}$ <p>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.</p> <p style="text-align: center;">Answer:</p> |
| 2 marks | <p>b) If the value of r was increased, would V be larger or smaller? Justify your answer.</p> <p style="text-align: center;">Answer:</p> |

END OF TEST

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