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| logo_b | **S6MA3ENA**  **Mathematics 3 Periods**  **B Test**  **WitH Calculator**  **Date : 25/06/19**  **08 :30 - 10 :00**  **Teacher : C. searle** |

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| **TiNSPIRE permitted in press-to-test mode.** | | |
| **/ 60** | *Comments* | *Signature* |

**TIME ALLOWED**

* 90 minutes

**NOTES**

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

There are **6** questions on this paper.

Each question is worth **10 marks** with a total of **60 marks** available.

If you finish within the allocated time, read your answers and check that they are sensible.

Good luck !

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|  | *Functions* |  |
| **Q1**  **(a)**  **(b)**  **(c)**  **(d)**  **(e)** | The functions *f*(*x*) and *g*(*x*) are defined to be    Draw a sketch of the graph of *f*(*x*) labelling clearly the coordinates for the vertex and all points where the graph intersects the coordinate axes.  The range for *g*(*x*) is written  What is the range for *f*(*x*)?  Write explicitly an expression for the composite function *g*(*f*(*x*)) and thus evaluate *g*(*f*(*2*)).  Solve the equation    Is the function *g*(*f*(*x-*1)) an *odd* function or an *even* function?  Give a reason for your answer. | [3 marks]  [2 marks]  [1 mark]  [2 marks]  [2 marks] |
|  | *Arithmetic and Geometric Series* |  |
| **Q2**  **(a)**  **(b)** | *You must justify your answers by writing all calculations that are relevant to your solutions.*  The 4th term of a geometric series is 10 and the 7th term is 80.  Use this information to find the common ratio and the first term for this series and hence find the sum of the first 15 terms.  A different series begins by adding the following numbers  14 + 19 + 24 +….  How many terms of this series must be added together in order to exceed the sum of the first 15 terms of the geometric series? | [5 marks]  [5 marks] |
|  | *Polynomial Differentiation* |  |
| **Q3**  **(a)**  **(b)**  **(c)**  **(d)** | The function    is defined for .  Use differentiation to determine the (*x, y*)coordinate for any stationary points of the function *y*  Classify the nature of any stationary points in terms of local maxima or minima.  Find the range of *x* values for which the curve is increasing.  Find the equation of the tangent line at *x* = 1 | [2 marks]  [3 marks]  [2 marks]  [3 marks] |
|  | *Probability* |  |
| **Q4**  **(a)**  **(b)** | Andy can walk to work, cycle or travel by bus. The choice he makes depends on the weather.  Copy and complete the tree diagram to show the probabilities for each of Andy’s methods of travel.  A day is selected at random. Calculate the probability of the following events:  (i) The weather is wet and Andy travels by bus.  (ii) Andy walks or cycles.  (iii) The weather is dry given that Andy walks or cycles. | [2 marks]  [2 marks]  [3 marks]  [3 marks] |
|  | *Binomial Distribution* |  |
| **Q5**  **(a)**  **(b)**  **(c)** | On a certain remote island, 25 per cent of the population have the gene *Hs* which is known to protect against malaria.  A random sample of 32 people have their blood tested to see if they have this gene.    Show that the sample will satisfy the conditions for a Bernoulli trial.  Determine the probability that the number that are found to have *Hs* is:  (i) Exactly 5  (ii) Fewer than 10  (iii) At least 6 but at most 12  (iv) More than the mean value for the distribution.  Will the conditions for a Bernoulli trial always be true for the population of the island? Write one or two sentences to justify your answer. | [2 marks]  [1 marks]  [1 marks]  [2 marks]  [2 marks]  [2 marks] |
|  | *Problem Solving with Maxima and Minima* |  |
| **Q6**  **(a)**  **(b)**  **(c)**  **(d)** | The length of the base of a cuboid is twice the width *x*, and its height is *h* centimetres, as shown in the diagram below.  Its total surface area is *A* cm2 and its volume is *V* cm3.      Show that .  The manufacturer needs the total surface area A = 300 cm2.  Find an expression for *h*, in terms of *x*. *[2m]*  Show that the volume . *[2m]*  Determine the maximum volume possible for the cuboid and determine the value of *h* that achieves this.  *You should explain in your answer how you know that this will be a maximum value.* | [2 marks]  [2 marks]  [1 mark]  [5 marks] |
|  | *End of Examination* |  |