Camberwell Girls Grammar School
An Anglican School - Educating Tomorrow's Woman

STUDENT NUMBER

Letter

Figures
Words

Student Name				
Teacher	Ms. Lobo	Ms. Kinnane	Ms. Bergamin	Mr. Naudi

MATHEMATICAL METHODS
Application Task –Preliminary Task
Friday 20th May 2016
Due Date: 3:30 pm Wednesday 25th May

Take Home Task

Number of questions	Number of questions to be answered	Number of marks
8	8	2

Instructions

- Write your name and student number in the spaces provided above on this page.

- All responses must be written in English.

- All questions must be completed prior to the first session of the SAC.

- This task will contribute **2 marks** to the overall SAC. The marks indicated next to each question are suggested marks and are designed to provide an indication of the workings required to be shown.

Technology free

An engineer is required to help in the construction of a ride in an amusement park. The engineer's skills are tested prior to employment, and his capabilities to design the ride are dependent on his ability to answer the following questions.

Question 1 (4 Marks)

Sketch the graph of $y = 2\tan\left(2x - \frac{\pi}{3}\right) + 1$, $x \in [0, 2\pi]$ (Do not include x-intercepts)

Question 2 (2+2=4 Marks)

a) Find the equation of a circle with centre (2,-C) and radius D, in terms of C and D.

b) State its domain and range in terms of C and D.
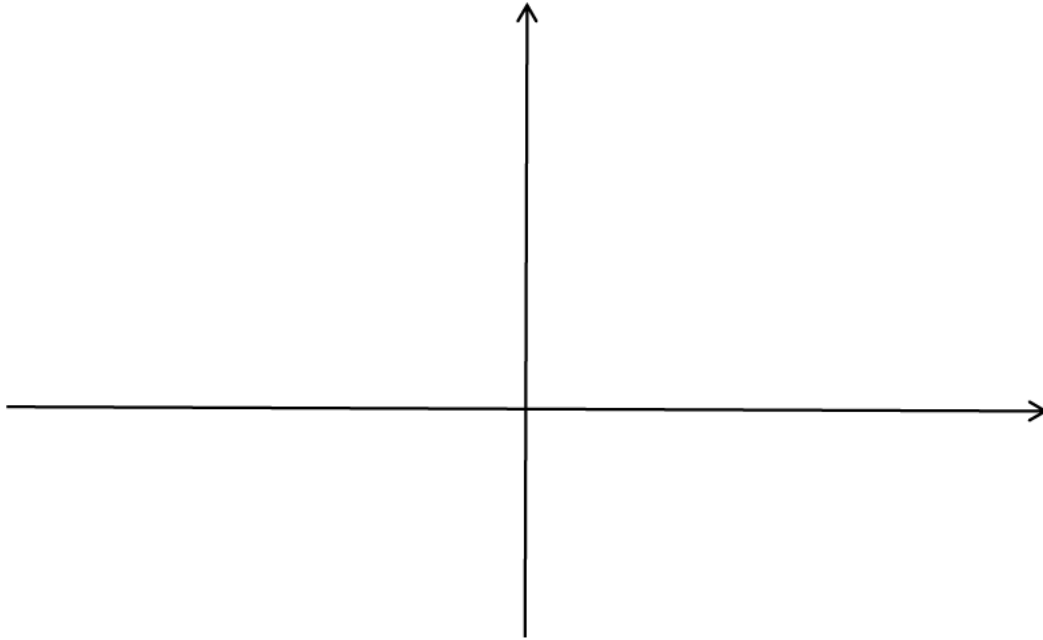
Question 3 (4 Marks)

Sketch the graph of $y = 3(x-1)^2(3x+2)(3-x)$, $x \in [-4, 4]$ (Label all intercepts and endpoint as co-ordinates).

Question 4 (2+2 = 4 Marks)

a) Find the inverse of the function $f(x) = 4^{6x-7} - 6K$ in terms of x and K

b) Find $g(f(x))$ if $g(x) = \frac{1}{2}x + \frac{3}{K}$
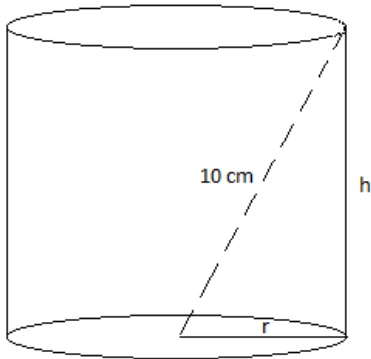
Question 5   **(1+1+2 = 4 Marks)**

A cylinder is to be designed so that the height 'h' and the radius 'r' are to have the relationship shown in the diagram.

a) Find **h** in terms of **r**.

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b) Determine the volume of the cylinder, in terms of *r*.

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c) Find the value for *r* which will give a maximum volume.

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Technology active

Question 6 **(1+2+2= 5 Marks)**

a) Differentiate with respect to x, the equation $y = 2a \log_{10}(4x) + 1$

b) Find the equation of the tangent when $x = 3$ in terms of a and x.

c) If $a = 2$, find the angle that this equation makes with the positive x-axis.

Question 7 **(2 Marks)**

Find the point/s of intersection between the graphs of $A(x) = 3\sin(2x) + 2$ and $B(x) = 2^{x-1} - 1$, where $\{x: 0 \leq x \leq 10\}$. Give your answer correct to three decimal places.

Question 8 (3 Marks)

Determine the equation of the parabola which passes through the point (0,-4) and has a gradient of 0 at (1,7)