PRESENTATION COLLEGE CHAGUANAS

CAPE MATHEMATICS UNIT I – *Internal Assessment Module 3*

Form: 6S1/N1/B1 ACADEMIC YEAR: 2015/16 Time: 1 hour

INSTRUCTIONS TO CANDIDATES

- Answer ALL questions
- Show all working clearly. Marks will be given for the correct steps in the solutions.
- The use of silent electronic calculators(non programmable) is allowed.
- Attempt each question on a new page

1.

a) A function *f(x)* is defined as follows $f(x) = \begin{cases} 6x - x^2 & x > 3 \\ 6x - 9 & x < 3 \end{cases}$

Find the $\lim_{x \to 3} f(x)$ [3mks]

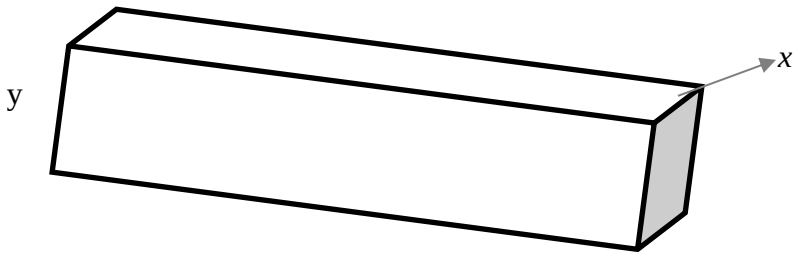
b) Determine the nature of the continuity or discontinuity of *f(x)* at *x* = 3. [2mks]

c) Differentiate from first principle f(*x*) =$\sqrt{x}$ [4mks]

d) (i) Sketch the curve y = x^2 -6x + 5 indicating the turning points and intersection with the axes. [3mks]

(i) the equation of the normal at x =1 [4mks]
(ii) the normal cuts the curve again at P, find the coordinates of P. [3mks]

2. The length of a closed rectangular box is 3 times its width (*x* cm), if its height is y cm and its volume, V is 972 cm ^{3}, then



(i)using variables *x* and *y*, find expressions for the surface area, A and volume V [2mks]
(ii)express A in terms of *x*. [2mks]
(iii) determine dimensions of the box if the surface area is to be a minimum. [5mks]

3. (a)Given $\int_0^{-2} f(x)dx = 6$ and $\int_0^4 f(x)dx = 18$ evaluate $\int_{-2}^4 f(x)dx$ [3mks]

(b) Differentiate $\frac{2+3x^2}{-3+x^2}$ with respect to *x* and hence find $\int \frac{99x}{(x^2-3)^2}\,dx$ [6mks]

(c) FIG 1shows a sketch of the curve $y = 6x - x^2 - 8$.

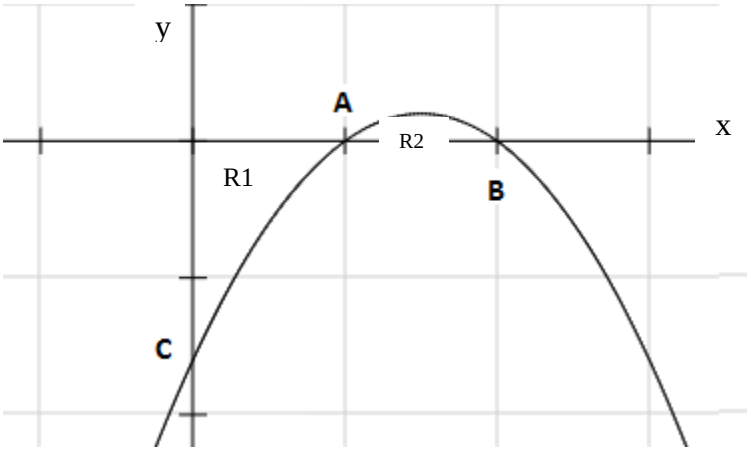


FIG 1.

(i) Find the coordinates of the points A, B and C [3mks]

(ii) The total area of R1 and R2 . [6mks]

(d) A silver ring is produced by rotating the area, A between the curves $y = x^2 + 1$ and $y = 3 - x^2$ through one revolution about the x-axis. Find the volume of gold required to make the ring. [7mks]

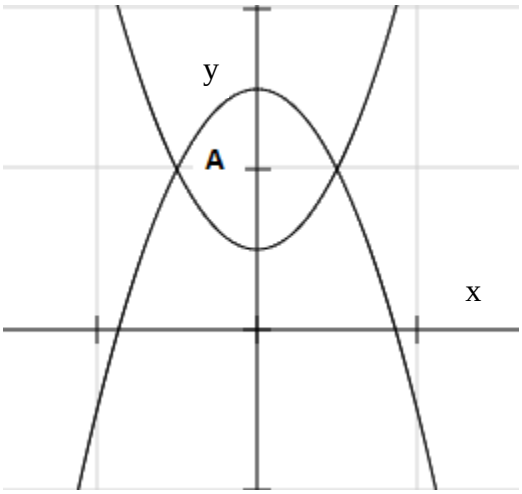


FIG 2

4.

Water drains from the cracked glass at the base of an aquarium that initially contained water at a depth of 64 cm. At time *t* mins after the water begins draining, the depth of the water is *x* cm. If the water level changes at a rate given by -4*t* -8. Find

(i) An expression for x in terms of t. [4mks]

(ii) How long it takes for the tank to be emptied? [3mks]