PRESENTATION COLLEGE CHAGUANAS

CAPE MATHEMATICS UNIT I – *Practice Test Module 3*

Form: 6S1/N1/B1 ACADEMIC YEAR: 2013/14 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 $f(x) = \begin{cases} x+2 & x<2 \\ x^2 & x>2 \end{cases}$

Find the $\lim_{x\to 2} f(x)$ [3mks]

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

c) Differentiate from first principle f(*x*) = $\frac{1}{\sqrt{x}}$. [4mks]

d)(i) Sketch the graph of y = $\frac{1}{x}$ [2mks]

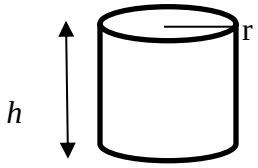
(ii) Find the equation of the normal to the curve where x = 2. [4mks]

(iii) Find the coordinates where the normal cuts the curve again. [3mks]

2. A cylindrical tin (with lid) of radius r cm is made of 300 cm ^{2} of a thin sheet of metal.

a) Show that the height, h cm is given by

$h = \frac{150 - \pi r^2}{\pi r}$



[3mks]

b) Find the values of r and h so that the can will contain the maximum possible volume. [5mks]

c) Hence determine the maximum volume. [2mks]

3. (a)Given the $\int_0^{-2} f(x)dx = 3$ and $\int_0^3 f(x)dx = 8$ evaluate the $\int_{-2}^3 f(x)dx$ [3mks]

(b) Differentiate $\frac{2+3x^2}{-3+x^2}$ with respect to *x* and hence find $\int \frac{88x}{(x^2-3)^2}\,dx$

[6mks]

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

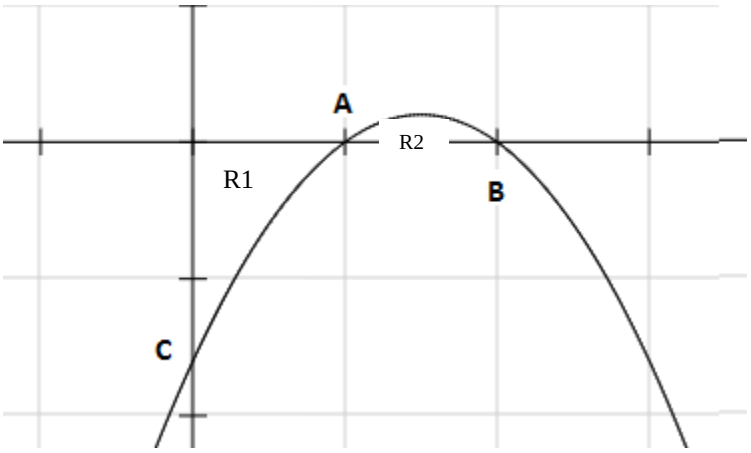


FIG 1.

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

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

(d) Find the volume of the solid formed when the region (R) bounded by the two curves $y = x^2 - 8x + 24$ and $y = 8x - x^2$ in FIG 2 is rotated through one revolution about the x-axis.

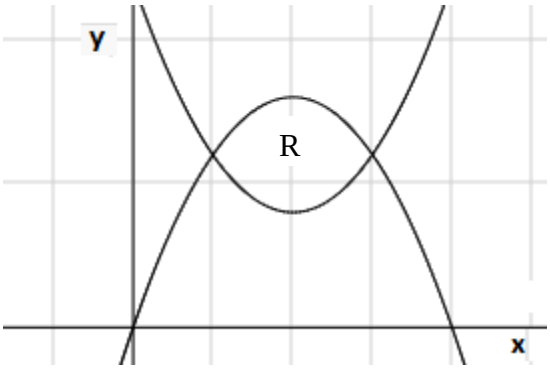


FIG 2 [6mks]

4.

Water drains from a punctured hole in the base of a tank that initially contained water of a depth of 32m. At time *t* mins after the water begins draining, the depth of the water is *x* m. If the water level changes at a rate of given by $-2t - 4$. Find

(i) An expression for x in terms of t. [5mks]

(ii) How long it takes for the tank to be emptied? [2mks]