# Core-Maths-C2 - 2008-June

## Question 1

$$f(x) = 2x^3 - 3x^2 - 39x + 20$$

(a) Use the factor theorem to show that $(x + 4)$ is a factor of $f(x)$.

**(2)**

(b) Factorise $f(x)$ completely.

**(4)**

## Question 2

$$y = \sqrt{(5^x + 2)}$$

(a) Complete the table below, giving the values of $y$ to 3 decimal places.

| $x$ | 0 | 0.5 | 1 | 1.5 | 2 |
|---|---|---|---|---|---|
| $y$ | | | 2.646 | 3.630 | |

**(2)**

(b) Use the trapezium rule, with all the values of $y$ from your table, to find an approximation for the value of $\int_0^2 \sqrt{(5^x + 2)}\,dx$ .

**(4)**

## Question 3

(a) Find the first 4 terms, in ascending powers of $x$, of the binomial expansion of $(1 + ax)^{10}$, where $a$ is a non-zero constant. Give each term in its simplest form.

**(4)**

Given that, in this expansion, the coefficient of $x^3$ is double the coefficient of $x^2$,

(b) find the value of $a$.

**(2)**

## Question 4

(a) Find, to 3 significant figures, the value of $x$ for which $5^x = 7$.

**(2)**

(b) Solve the equation $5^{2x} - 12(5^x) + 35 = 0$.

**(4)**

## Question 5

The circle $C$ has centre (3, 1) and passes through the point $P(8, 3)$.

(a) Find an equation for $C$.

**(4)**

(b) Find an equation for the tangent to $C$ at $P$, giving your answer in the form $ax + by + c = 0$, where $a$, $b$ and $c$ are integers.

**(5)**

## Question 6

A geometric series has first term 5 and common ratio $\frac{4}{5}$.

Calculate

(a) the 20th term of the series, to 3 decimal places,

**(2)**

(b) the sum to infinity of the series.

**(2)**

Given that the sum to $k$ terms of the series is greater than 24.95,

(c) show that $k > \frac{\log 0.002}{\log 0.8}$,

**(4)**

(d) find the smallest possible value of $k$.

**(1)**

# Question 7

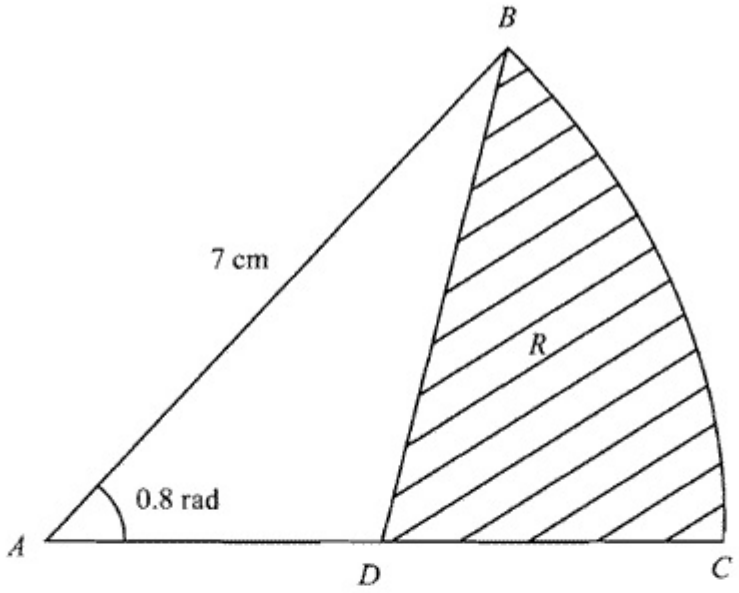


**Figure 1**

Figure 1 shows $ABC$, a sector of a circle with centre $A$ and radius 7 cm.

Given that the size of $\angle BAC$ is exactly 0.8 radians, find

(a) the length of the arc $BC$,

**(2)**

(b) the area of the sector $ABC$.

**(2)**

The point $D$ is the mid-point of $AC$. The region $R$, shown shaded in Figure 1, is bounded by $CD$, $DB$ and the arc $BC$.

Find

(c) the perimeter of $R$, giving your answer to 3 significant figures,

**(4)**

(d) the area of $R$, giving your answer to 3 significant figures.

**(4)**

# Question 8

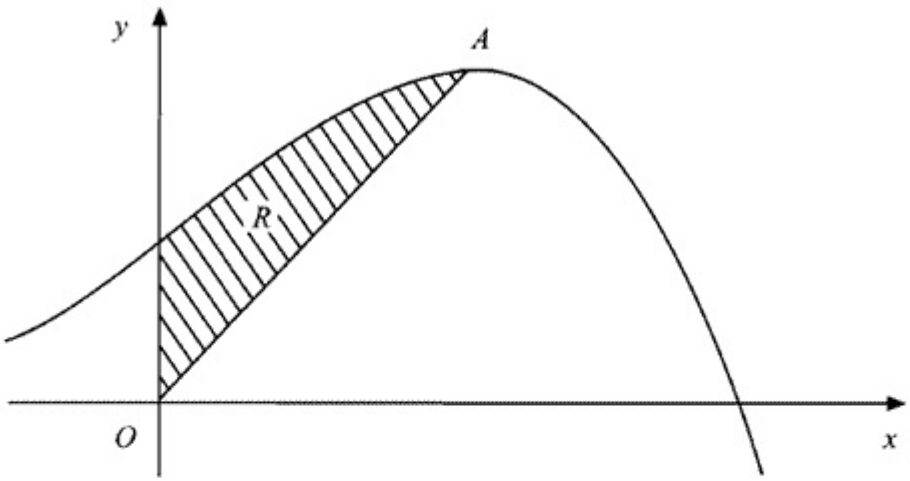


**Figure 2**

Figure 2 shows a sketch of part of the curve with equation $y = 10 + 8x + x^2 - x^3$.

The curve has a maximum turning point $A$.

(a) Using calculus, show that the $x$-coordinate of $A$ is 2.

**(3)**

The region $R$, shown shaded in Figure 2, is bounded by the curve, the $y$-axis and the line from $O$ to $A$, where $O$ is the origin.

(b) Using calculus, find the exact area of $R$.

**(8)**

# Question 9

Solve, for $0 \leqslant x < 360°$,

(a) $\sin(x - 20°) = \frac{1}{\sqrt{2}}$

**(4)**

(b) $\cos 3x = -\frac{1}{2}$

**(6)**