Core Mathematics C2

Advanced Subsidiary

Extension Practice Paper

Time: 1 hour 30 minutes

(1) In the binomial expansion of $(p+qx)^r$ where $0<p<q<r<8$ the constant is 16 and the coefficients of the terms in x^3 and x^2 are equal. Find the values of the integers p, q and r showing clearly how you found each.

(5 marks)

(2) Two circles C_1 and C_2 both have the coordinate axes as tangents.

The equation of C_1 is $(x-a)^2+(y-b)^2=25$ where $a<0,\ b>0$

The equation of C_2 $(x-c)^2+(y-d)^2=16$ where $c,\ d>0$

C_1 touches the x axis at the point A and has its centre at the point B

C_2 touches the x axis at the point D and has its centre at the point C

Find the area of the quadrilateral $ABCD$ giving your answer as an exact fraction.

(9 marks)

(3) $r(x)=p\cos^2(x)-1, p>1$

(a) Sketch the graph of $y=r(x)$ for $-2\pi \le x \le 2\pi$ showing any points where the graph meets or crosses the coordinate axes.

(4 marks)

The line $y=1$ intersects the graph $y=s(x)$ where $s(x)=t\cos^2(x)-1, t>0$ four times in the interval $-2\pi \le x \le 0$. Given the vertical distance between the maximum and minimum points of $s(x)$ is 4

(b) Find the x coordinates of the four points of intersection of $y=1$ and $y=s(x)$ for $-2\pi \le x \le 0$ *(6 marks)*

(4) The function $h(x)$ is transformed to give the function $g(x)$ where $g(x)=x^3+x^2-20x$. The transformation from $h(x)$ to $g(x)$ is a scale factor stretch of 0.5 parallel to the x axis. Find the area trapped between the curve and the x axis for the function $h(x)$.

(9 marks)

(5) A circle has equation $(x-a)^2+(y-a)^2=a^2$ where a is a constant. The line $y+x-a=0$ splits the area of the circle into 2 parts, A_1 and A_2 where $A_1>A_2$. Find the area of A_2 giving your answer in the form $\dfrac{a^2}{b}(c\pi+d)$ where b,c and d are integers.

(8 marks)

(6) A geometric series has first term a and common ratio r where a and r are positive constants.

The fourth term of the series is p^{-1}, the sum to infinity of the series is p and the sum of the first two terms of the series is $0.75p$ where p is a positive constant. Find the values of a, r and p .

(9 marks)

(7) The points $ABCD$ with coordinates $A(3,1)$, $B(8,6)$, $C(11,-3)$ and $D(p,q)$ all line on the circumference of a circle drawn clockwise from A to D. Find the size of angle CDA giving your answer in radians to 3 SF.
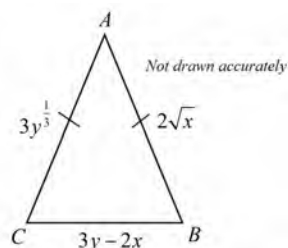
(9 marks)

(8) In the triangle ABC the length $BC=6cm$.

Find the size of angle CAB in radians and the perimeter of triangle ABC.

You must show clearly how you found your answers. *(9 marks)*

(9) Point $A(2,1)$ and point $B(4,2)$ form part of the regular hexagon $ABCDEF$.

Find the area of triangle ACE in the form $p\sqrt{q}$ where p and q are rational constants. *(7 marks)*