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Core Mathematics C1

Advanced Subsidiary

Extension Practice Paper

Time: 1 hour 30 minutes

(1) The n th derivative of the function $t(x)$ where $t(x) = 5x^6 - 9x^5 + 3x^3 - 0.5$ is a cubic function.

(a) State the value of n

(b) Find the ratio of the coefficient in x^3 to the coefficient in x^2 of the cubic function giving your answer in the form $1:k$ where k is a fraction in its simplest form.

(5 marks)

(2) Find the values of the constants p and q such that $\frac{\sqrt{p}}{\sqrt{p+2p}} = \frac{2\sqrt{p-q}}{3p+q}$, $p, q \geq 0$

(6 marks)

(3) Given $0 < a < 1$ put the following expressions in ascending order:

$$\frac{1}{\sqrt{a}}, a^{-1}, a, a^{1.3}, a^{\frac{1}{3}}, \sqrt[2]{a^5}, (a \times a - 1), (a^{-2})^{\frac{1}{8}}$$

(6 marks)

(4) The line l passing through the points A and B forms the right angled triangle AOB where O is the origin.

The area of the triangle AOB is $4\sqrt{3}$. Given A lies on the negative y axis and B has coordinates $(4, 0)$ find the equation of the line l in the form $y = mx + c$.

(9 marks)

(5) The line $y = k$ where k is a constant passes through the curve with equation $y = x^2 - x - 12$ at the points A and B where A and B are integers.

Given the length of the line segment AB is 9 units find the value of k .

(9 marks)

(6) The function $t(x)$ at the point $T(3, 18)$ has gradient $1.5t(x)$.

Given the second derivative of the function $t(x)$ is $2(3x + 1)$ sketch the curve $y = t(x)$ clearly showing any points of intersection with the coordinate axes.

(9 marks)

(7) The line l with equation $y = ax + b$ cuts the lines $x = -2$ and $x = 4$ at the

points A and B where y_A and y_B are p and $\frac{2}{3}p$ respectively, $p < 0$.

The points C and D are the points where the lines $x = -2$ and $x = 4$ cross the coordinate axis. The trapezium $ABCD$ has an area of 24. Find the distance from the origin to the point where line l crosses the x axis.

(12 marks)

(8) A circle with area $\frac{25}{9}\pi$ touches the x axis at the point $(4, 0)$.

The point T is the furthest point on the circle from the origin O .

Find the length of OT giving your answer as a simplified fraction.

(9 marks)

(9) The functions g and h are given by $g(x) = 4x^{-0.5}$, $x \geq 0$ and $h(x) = x^{0.5} - 3$, $x \geq 0$.

The graphs $y = g(x)$ and $y = h(x)$ intersect at the point A .

The graph $y = h(x)$ crosses the x axis at B .

Find the length of the line segment AB giving your answer in the form $p\sqrt{q}$ where p and q are integers.

(10 marks)