ADDITONAL MATHEMATICS

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CLASSIFIED SIMALTANEOUS EQUATIONS

Compiled & Edited
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6 The curves $y = x^2$ and $3y = -2x^2 + 20x - 20$ meet at the point $A$.

(i) Show that the $x$-coordinate of $A$ is 2. [1]

(ii) Show that the gradients of the two curves are equal at $A$. [3]

(iii) Find the equation of the tangent to the curves at $A$. [1]

4 Find the set of values of $k$ for which the line $y = 2x - 5$ cuts the curve $y = x^2 + kx + 11$ in two distinct points. [6]
6. The line $y = 3x - 9$ intersects the curve $49x^2 - y^2 + 42x + 8y = 247$ at the points $A$ and $B$. Find the length of the line $AB$. [7]

6. The line $y = x + 4$ intersects the curve $2x^2 + 3xy - y^2 + 1 = 0$ at the points $A$ and $B$. Find the length of the line $AB$. [7]

8. The equation of the curve $C$ is $2y = x^2 + 4$. The equation of the line $L$ is $y = 3x - k$, where $k$ is an integer.

(i) Find the largest value of the integer $k$ for which $L$ intersects $C$. [4]

(ii) In the case where $k = -2$, show that the line joining the points of intersection of $L$ and $C$ is bisected by the line $y = 2x + 5$. [4]

1. Find the coordinates of the points of intersection of the curve $y^2 + y = 10x - 8x^2$ and the straight line $y + 4x + 1 = 0$. [5]

3. The line $y = 3x + k$ is a tangent to the curve $x^2 + xy + 16 = 0$.

(i) Find the possible values of $k$. [3]

(ii) For each of these values of $k$, find the coordinates of the point of contact of the tangent with the curve. [2]
2 Find the coordinates of the points where the line $2y = x - 1$ meets the curve $x^2 + y^2 = 29$. [5]

3 The straight line $3x = 2y + 18$ intersects the curve $2x^2 - 23x + 2y + 50 = 0$ at the points $A$ and $B$. Given that $A$ lies below the $x$-axis and that the point $P$ lies on $AB$ such that $AP : PB = 1 : 2$, find the coordinates of $P$. [6]

7 Solve, for $x$ and $y$, the simultaneous equations

\[ 125^x = 25(5^y), \]
\[ 7^x + 49^y = 1. \] [6]

2 The line $y + 4x = 23$ intersects the curve $xy + x = 20$ at two points, $A$ and $B$. Find the equation of the perpendicular bisector of the line $AB$. [6]

3 Find the coordinates of the points where the straight line $y = 2x - 3$ intersects the curve $x^2 + y^2 + xy + x = 30$. [5]
10  The line $y = 2x + 10$ intersects the curve $2x^2 + 3xy - 5y + y^2 = 218$ at the points $A$ and $B$. Find the equation of the perpendicular bisector of $AB$. [9]

5  Find the set of values of $m$ for which the line $y = mx - 2$ cuts the curve $y = x^2 + 8x + 7$ in two distinct points. [6]

1  Find the coordinates of the points at which the straight line $y + 2x = 7$ intersects the curve $y^2 = xy - 1$. [4]

1  Find the values of $k$ for which the line $y = kx - 2$ meets the curve $y^2 = 4x - x^2$. [4]

2  Find the $x$-coordinates of the three points of intersection of the curve $y = x^3$ with the line $y = 5x - 2$, expressing non-integer values in the form $a \pm \sqrt{b}$, where $a$ and $b$ are integers. [5]
6 The curves \( y = x^2 \) and \( 3y = -2x^2 + 20x - 20 \) meet at the point A.

\[ y = x^2 \]
\[ 3y = -2x^2 + 20x - 20 \]

(i) Show that the \( x \)-coordinate of A is 2. [1]

(ii) Show that the gradients of the two curves are equal at A. [3]

(iii) Find the equation of the tangent to the curves at A. [1]

1 Find the value of \( k \) for which the \( x \)-axis is a tangent to the curve

\[ y = x^2 + (2k + 10)x + k^2 + 5. \] [3]
4 Find the set of values of $k$ for which the line $y = 2x - 5$ cuts the curve $y = x^2 + kx + 11$ in two distinct points. [6]

5 The straight line $2x + y = 14$ intersects the curve $2x^2 - y^2 = 2xy - 6$ at the points $A$ and $B$. Show that the length of $AB$ is $24\sqrt{5}$ units. [7]

3 Find the set of values of $m$ for which the line $y = mx + 2$ does not meet the curve $y = x^2 - 5x + 18$. [5]

3 The line $y = mx + 2$ is a tangent to the curve $y = x^2 + 12x + 18$. Find the possible values of $m$. [4]

5 Find the set of values of $m$ for which the line $y = mx - 2$ cuts the curve $y = x^2 + 8x + 7$ in two distinct points. [6]
The line $y = 3x - 9$ intersects the curve $49x^2 - y^2 + 42x + 8y = 247$ at the points $A$ and $B$. Find the length of the line $AB$. [7]

Find the value of $k$ for which the $x$-axis is a tangent to the curve 

$$y = x^2 + (2k + 10)x + k^2 + 5.$$ [3]

Without using a calculator, solve, for $x$ and $y$, the simultaneous equations

$$8^x + 2^y = 64,$$

$$3^{4x} \times \left(\frac{1}{4}\right)^{y-1} = 81.$$ [5]

Find the values of the constant $c$ for which the line $2y = x + c$ is a tangent to the curve $y = 2x + \frac{6}{x}$. [4]

The line $x + y = 10$ meets the curve $y^2 = 2x + 4$ at the points $A$ and $B$. Find the coordinates of the mid-point of $AB$. [5]