1) The equation of a curve is given by $y = 2x^2 + ax + 14$, where $a$ is a constant.

Given that this equation can also be written as $y = 2(x - 3)^2 + b$, where $b$ is a constant, find

**(i)** the value of $a$ and of $b$, [2]

**(ii)** the minimum value of $y$. [1]

2) 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]

3) Find the values of $k$ for which the equation $x^2 - 2(2k + 1)x + (k + 2) = 0$ has two equal roots. [4]

4) **(i)** Express $4x^2 - 12x + 3$ in the form $(ax + b)^2 + c$, where $a, b$ and $c$ are constants and $a > 0$. [3]

**(ii)** Hence, or otherwise, find the coordinates of the stationary point of the curve $y = 4x^2 - 12x + 3$. [2]

**(iii)** Given that $f(x) = 4x^2 - 12x + 3$, write down the range of f. [1]

5) 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]

6) 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]

7) 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]

8) The line $y = 5x - 3$ is a tangent to the curve $y = kx^2 - 3x + 5$ at the point $A$. Find

**(i)** the value of $k$, [3]

**(ii)** the coordinates of $A$. [2]

9) Find the coordinates of the points where the straight line $y = 2x - 3$ intersects the curve $x^2 + y^2 + xy + x = 30$. [5]