Quadratic Equation

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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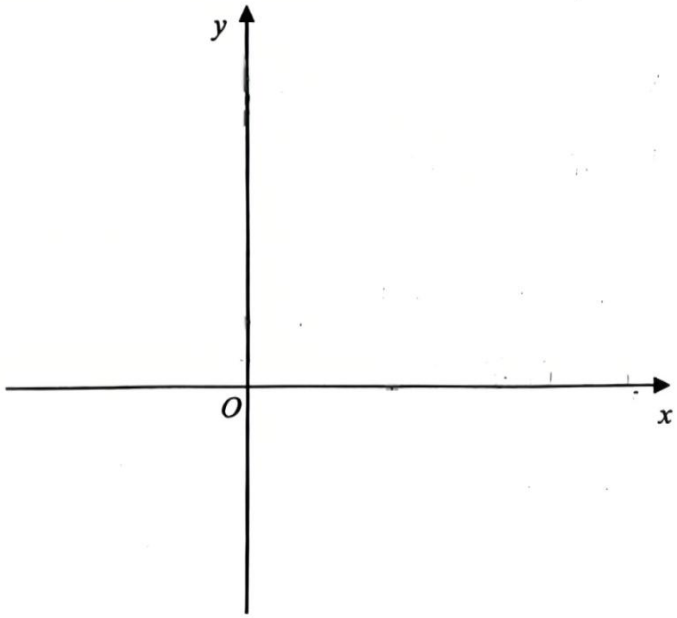
1 Factorise $27a^3 - 343$. [2]

2 Solve the inequality $x - 1 > 3(x^2 - 5)$. [3]

3 **(i)** Express $y = x^2 - 6x + 13$ in the form $y = (x+h)^2 + k$, where h and k are constants. [2]

(ii) Sketch the graph of $y = x^2 - 6x + 13$, indicating clearly the y-intercept and the **coordinates** of the turning point. [3]



(iii) State the range of values of $\frac{1}{y}$. [1]

4 **(a)** Solve the equation $2x^3 - 7x + 2 = 0$. Show your working clearly. **[4]**

4 **(b)** Express $\dfrac{9x}{(2x-1)(x+1)^2}$ in partial fractions. [5]

5 The function $f(x) = x^4 + x^3 + mx^2 + nx - 6$, where m and n are constants, is exactly divisible by $(x+1)$ and $(x-2)$.

(i) Find the value of m and of n. [4]

(ii) Using the values of m and n found in part **(i)**,

(a) find the remainder when $f(x)$ is divided by $(x+3)$, [1]

(b) determine, showing all necessary working, the number of real roots of the equation $f(x) = 0$. [3]

6 Show that the line $y = 2cx - \frac{15}{4}$ will intersect the curve $y = x^2 + 4x - 3c$ for all values of c. [5]

7 Find the range of values of h for which the expression $(2h-4)x^2+8x+h$ is always positive for all real values of x. [4]

8 Find the range of values of x for which $\dfrac{x^2+2}{2x^2-5x-3}<0$. [3]

End of Paper