3 **(a)** Solve the equation $|2x-3|=|5x+2|$. [3]

(b) Hence solve the equation $|2\sec\theta-3|=|5\sec\theta+2|$ for $\pi<\theta<2\pi$. Give your answer correct to 3 significant figures. [3]

7 The polynomial $\mathrm{p}(x)$ is defined by

$$\mathrm{p}(x)=2x^4+kx^3+kx^2+17x+18,$$

where k is a constant. It is given that $(x+2)$ is a factor of $\mathrm{p}(x)$.

(a) Find the value of k. [2]

It is given that the equation $\mathrm{p}(x)=0$ has exactly two real roots, denoted by α and β, where α is an integer and β is not an integer.

(b) State the value of α and show that β satisfies the equation $x=\sqrt[3]{-2x-4.5}$. [4]

(c) Show by calculation that $-1.4 < \beta < -1.0$. [2]

(d) Use an iterative formula, based on the equation in part **(b)**, to find the value of β correct to 3 significant figures. Give the result of each iteration to 5 significant figures. [3]

3 **(a)** Solve the inequality $|3x-4| \leqslant |2x+5|$. [4]

(b) Hence find the largest integer N satisfying the inequality $|3\times 7^{0.01N}-4| \leqslant |2\times 7^{0.01N}+5|$. [3]

4 The polynomial $\mathrm{p}(x)$ is defined by

$$\mathrm{p}(x) = x^4 - 10x^3 + 20x^2 - 30x + 40.$$

(a) Find the quotient when $\mathrm{p}(x)$ is divided by $(x^2 + 3)$ and show that the remainder is –11. [3]

(b) Hence find the real roots of the equation $\mathrm{p}(x) + 11 = 0$. Give your answers in exact form. [3]

2 **(a)** Use logarithms to solve the inequality $4^x < 0.05$. Give your answer in the form $x < a$, where the value of a is correct to 3 significant figures. [2]

(b) Solve the inequality $|3x + 8| < 9$. [3]

(c) Hence state the integers that satisfy both of the inequalities in parts **(a)** and **(b)**. [1]

5 The polynomial $p(x)$ is defined by

$$p(x) = ax^3 + bx^2 - ax - 24,$$

where a and b are constants. It is given that $(2x-3)$ is a factor of $p(x)$ and that the remainder is -15 when $p(x)$ is divided by $(x+1)$.

(a) Find the values of a and b. [4]

(b) Hence factorise $p(x)$ completely. [3]

(c) Hence solve the equation $p(3\operatorname{cosec}\theta) = 0$ for $90° < \theta < 270°$. [2]

2 **(a)** Sketch on the same diagram the graphs of $y = |2x - 9|$ and $y = 4x - 5$. [2]

(b) Solve the inequality $|2x - 9| < 4x - 5$. [3]

5 The polynomial $\mathrm{p}(x)$ is defined by

$$\mathrm{p}(x) = ax^4 + bx^3 + 13x^2 - 35x + 15,$$

where a and b are constants. It is given that $(2x - 1)$ and $(x - 3)$ are factors of $\mathrm{p}(x)$.

(a) Find the values of a and b. [4]

(b) Hence factorise $\mathrm{p}(x)$. [3]

(c) Find the least positive value of θ in radians such that $\mathrm{p}(\cot 2\theta) = 0$. [2]