1. The function $f(x) = 4x^3 + 2ax - 7a$, $a \in \mathbb{R}$ leaves a remainder of -10 when divided by $(x - a)$.

(a) Find the value of a.

(3)

(b) Show that for this value of a there is a unique real solution to the equation $f(x) = 0$.

(2)

(Total 5 marks)

2. Given that $Ax^3 + Bx^2 + x + 6$ is exactly divisible by $(x + 1)(x - 2)$, find the value of A and the value of B.

(Total 5 marks)

3. When the function $q(x) = x^3 + kx^2 - 7x + 3$ is divided by $(x + 1)$ the remainder is seven times the remainder that is found when the function is divided by $(x + 2)$.

Find the value of k.

(Total 5 marks)

4. When $3x^5 - ax + b$ is divided by $x - 1$ and $x + 1$ the remainders are equal. Given that $a, b \in \mathbb{R}$, find

(a) the value of a;

(4)

(b) the set of values of b.

(1)

(Total 5 marks)

5. The polynomial $P(x) = x^3 + ax^2 + bx + 2$ is divisible by $(x + 1)$ and by $(x - 2)$.

Find the value of a and of b, where $a, b \in \mathbb{R}$.

(Total 6 marks)

6. When $f(x) = x^4 + 3x^3 + px^2 - 2x + q$ is divided by $(x - 2)$ the remainder is 15, and $(x + 3)$ is a factor of $f(x)$.

Find the values of p and q.

(Total 6 marks)

7. The polynomial $f(x) = x^3 + 3x^2 + ax + b$ leaves the same remainder when divided by $(x - 2)$ as when divided by $(x + 1)$. Find the value of a.

(Total 6 marks)