1 You are given that $f(x) = 4x^3 + kx + 6$, where k is a constant. When $f(x)$ is divided by $(x - 2)$, the remainder is 42. Use the remainder theorem to find the value of k. Hence find a root of $f(x) = 0$. **[4]**

2 You are given that $f(x) = x^5 + kx - 20$. When $f(x)$ is divided by $(x - 2)$, the remainder is 18. Find the value of k. **[3]**

3 $n - 1$, n and $n + 1$ are any three consecutive integers.

(i) Show that the sum of these integers is always divisible by 3. **[1]**

(ii) Find the sum of the squares of these three consecutive integers and explain how this shows that the sum of the squares of any three consecutive integers is never divisible by 3. **[3]**

4 You are given that $f(x) = x^4 - x^3 + x^2 + 9x - 10$.

(i) Show that $x = 1$ is a root of $f(x) = 0$ and hence express $f(x)$ as a product of a linear factor and a cubic factor. **[3]**

(ii) Hence or otherwise find another root of $f(x) = 0$. **[2]**

(iii) Factorise $f(x)$, showing that it has only two linear factors. Show also that $f(x) = 0$ has only two real roots. **[5]**

5 The function $f(x) = x^4 + bx + c$ is such that $f(2) = 0$. Also, when $f(x)$ is divided by $x + 3$, the remainder is 85.

Find the values of b and c. **[5]**

6 Simplify $(n + 3)^2 - n^2$. Hence explain why, when n is an integer, $(n + 3)^2 - n^2$ is never an even number.

Given also that $(n + 3)^2 - n^2$ is divisible by 9, what can you say about n? **[4]**

7 A line L is parallel to the line $x + 2y = 6$ and passes through the point (10, 1). Find the area of the region bounded by the line L and the axes. **[5]**

8 Simplify $\dfrac{(3xy^4)^3}{6x^5y^2}$. **[3]**

9 When $x^3 + 2x^2 + 5x + k$ is divided by $(x + 3)$, the remainder is 6. Find the value of k. **[3]**

10 When $x^3 - kx + 4$ is divided by $x - 3$, the remainder is 1. Use the remainder theorem to find the value of k. **[3]**

11 You are given that $f(x) = x^4 + ax - 6$ and that $x - 2$ is a factor of $f(x)$.

Find the value of a. **[3]**

12 When $x^3 + kx + 7$ is divided by $(x - 2)$, the remainder is 3. Find the value of k. [3]