4 Solve the equation $x^3 - 4x^2 - 11x + 2 = 0$, expressing non-integer solutions in the form $a \pm b\sqrt{2}$, where a and b are integers. [6]

10 The remainder when $2x^3 + 2x^2 - 13x + 12$ is divided by $x + a$ is three times the remainder when it is divided by $x - a$.

(i) Show that $2a^3 + a^2 - 13a + 6 = 0$. [3]

(ii) Solve this equation completely. [5]

6 The cubic polynomial f(x) is such that the coefficient of x^3 is 1 and the roots of f(x) = 0 are -2, $1 + \sqrt{3}$ and $1 - \sqrt{3}$.

(i) Express f(x) as a cubic polynomial in x with integer coefficients. [3]

(ii) Find the remainder when f(x) is divided by $x - 3$. [2]

(iii) Solve the equation $f(-x) = 0$. [2]

(a) The expression $f(x) = x^3 + ax^2 + bx + c$ leaves the same remainder, R, when it is divided by $x + 2$ and when it is divided by $x - 2$.

(i) Evaluate b. [2]

f(x) also leaves the same remainder, R, when divided by $x - 1$.

(ii) Evaluate a. [2]

f(x) leaves a remainder of 4 when divided by $x - 3$.

(iii) Evaluate c. [1]

(b) Solve the equation $x^3 + 3x^2 = 2$, giving your answers to 2 decimal places where necessary. [5]

6 Solve the equation $x^2(2x + 3) = 17x - 12$. [6]

1 The equation of a curve is given by $y = x^2 + ax + 3$, where a is a constant. Given that this equation can also be written as $y = (x + 4)^2 + b$, find

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

(ii) the coordinates of the turning point of the curve. [1]

5 Solve the equation $3x(x^2 + 6) = 8 - 17x^2$. [6]

2 The expression $6x^3 + ax^2 - (a + 1)x + b$ has a remainder of 15 when divided by $x + 2$ and a remainder of 24 when divided by $x + 1$. Show that $a = 8$ and find the value of b. [5]

3 It is given that $x - 1$ is a factor of $f(x)$, where $f(x) = x^3 - 6x^2 + ax + b$.

(i) Express b in terms of a. [2]

(ii) Show that the remainder when $f(x)$ is divided by $x - 3$ is twice the remainder when $f(x)$ is divided by $x - 2$. [4]

5 Solve the equation $2x^3 - 3x^2 - 11x + 6 = 0$. [6]

where n is a positive integer and $\binom{\ }{r} = \dfrac{n!}{(n-r)!r!}$.