

- 1
- Tests a suitable integer value and obtains $f(-2) = 0$. (M1)
 - Concludes that $(x + 2)$ is a factor. (A1)
 - Divides $f(x)$ by $(x + 2)$. (M1)
 - Obtains the quotient $2x^2 - 11x + 5$. (A1)
 - Factorises the quadratic as $(2x - 1)(x - 5)$. (M1)
 - Hence obtains $(x + 2)(2x - 1)(x - 5)$. (A1)

(Total for question 1 is 6 marks)

- 2
- (a)
- Substitutes $x = -3$ into $g(x)$: $g(-3) = 4(-3)^3 - 8(-3)^2 - 35(-3) + 75$. (M1)
 - Obtains $g(-3) = 0$ and concludes that $(x + 3)$ is a factor. (A1)
- (b)
- Divides $g(x)$ by $(x + 3)$. (M1)
 - Obtains the quotient $4x^2 - 20x + 25$. (A1)
 - Factorises $4x^2 - 20x + 25$ as $(2x - 5)^2$. (M1)
 - Hence gives $g(x) = (x + 3)(2x - 5)^2$, with $a = 2$ and $b = -5$. (A1)

(Total for question 2 is 6 marks)

- 3
- (a)
- Uses $f(4) = 0$ to form $160 + 4p + q = 0$ and $f(-5) = 36$ to form $-5p + q = 11$. (M1)
 - Solves the simultaneous equations to obtain $p = -19$. (A1)
 - Obtains $q = -84$. (A1)
- (b)
- Uses $f(4) = 0$ to identify $(x - 4)$ as a factor. (M1)
 - Divides $x^3 + 6x^2 - 19x - 84$ by $(x - 4)$. (M1)
 - Obtains the quotient $x^2 + 10x + 21$. (A1)
 - Hence gives the complete factorisation $(x - 4)(x + 3)(x + 7)$. (A1)

(Total for question 3 is 7 marks)

4

- (a)
- Substitutes $x = 2$ into $f(x)$: $f(2) = 2(2)^3 - (2)^2 - 13(2) + 14$. (M1)
 - Obtains $f(2) = 0$ and concludes that $(x - 2)$ is a factor. (A1)
- (b)
- Divides by $(x - 2)$ using a valid algebraic method. (M1)
 - Obtains $(x - 2)(2x^2 + 3x - 7) = 0$. (A1)
 - Applies the quadratic formula to $2x^2 + 3x - 7 = 0$. (M1)
 - Obtains one correct quadratic root, $x = 1.27$ or $x = -2.77$, to 2 decimal places. (A1)
 - Gives all solutions: $x = 2$, $x = 1.27$, and $x = -2.77$. (A1)

(Total for question 4 is 7 marks)

5

- (a)
- Uses the factor theorem to set $f(2) = 0$, giving $2^3 + 2k - 2 = 0$. (M1)
 - Solves to obtain $k = -3$. (A1)
- (b)
- Substitutes $k = -3$ to obtain $x^3 - 3x - 2 = 0$. (B1)
 - Divides by $(x - 2)$ using a valid algebraic method. (M1)
 - Obtains $(x - 2)(x^2 + 2x + 1) = (x - 2)(x + 1)^2$. (A1)
 - Gives the solutions $x = 2$ and $x = -1$. (A1)

(Total for question 5 is 6 marks)

6

- (a)
- Substitutes $x = -3$ into $f(x)$: $f(-3) = (-3)^3 + 6(-3)^2 + 4(-3) - 15$. (M1)
 - Obtains $f(-3) = 0$ and concludes that $x = -3$ is a solution. (A1)
- (b)
- Uses $x = -3$ to identify $(x + 3)$ as a factor and divides the cubic by $(x + 3)$. (M1)
 - Obtains the quotient $x^2 + 3x - 5$. (A1)
 - Applies the quadratic formula to $x^2 + 3x - 5 = 0$. (M1)
 - Obtains one correct root, $x = 1.19$ or $x = -4.19$, to 2 decimal places. (A1)
 - Gives both other solutions: $x = 1.19$ and $x = -4.19$. (A1)

(Total for question 6 is 7 marks)
