Topic Y1 Polynomials and graphs (Post-TT) [41]

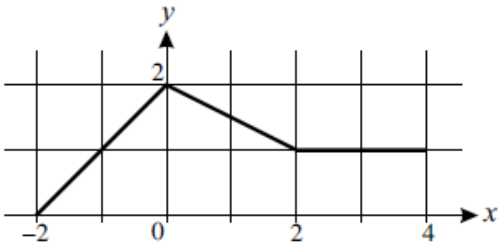
1.

$$f(x) = 2x^3 - 5x^2 + ax + a$$

Given that $(x + 2)$ is a factor of $f(x)$, find the value of the constant a.

(3)

2.



The graph of $y = f(x)$ for $-2 \leqslant x \leqslant 4$ is shown above.

(i) Sketch the graph of $y = 2f(x)$ for $-2 \leqslant x \leqslant 4$ on the axes provided. **[2]**

(ii) Describe the transformation which transforms the graph of $y = f(x)$ to the graph of $y = f(x - 1)$. **[2]**

3.

(i) Expand $(x - 2)^2(x + 1)$, simplifying your answer. **[3]**

(ii) Sketch the curve $y = (x - 2)^2(x + 1)$, indicating the coordinates of all intercepts with the axes. **[3]**

4.

When $x^4 - 2x^3 - 7x^2 + 7x + a$ is divided by $x^2 + 2x - 1$, the quotient is $x^2 + bx + 2$ and the remainder is $cx + 7$. Find the values of the constants a, b and c. [5]

5.

(i) Sketch the curve $y = 12 - x - x^2$, giving the coordinates of all intercepts with the axes. **[5]**

(ii) Solve the inequality $12 - x - x^2 > 0$. **[2]**

(iii) Find the coordinates of the points of intersection of the curve $y = 12 - x - x^2$ and the line $3x + y = 4$. **[5]**

6.

Two cubic polynomials are defined by

$$f(x) = x^3 + (a - 3)x + 2b, \quad g(x) = 3x^3 + x^2 + 5ax + 4b,$$

where a and b are constants.

(i) Given that $f(x)$ and $g(x)$ have a common factor of $(x - 2)$, show that $a = -4$ and find the value of b. **[6]**

(ii) Using these values of a and b, factorise $f(x)$ fully. Hence show that $f(x)$ and $g(x)$ have two common factors. **[5]**