

## Section 1: Polynomial functions and graphs

## Solutions to Exercise level 2

1. (i)  $(3x^2 - x + 2)(2x^2 + 5x - 1)$

$$= 3x^2(2x^2 + 5x - 1) - x(2x^2 + 5x - 1) + 2(2x^2 + 5x - 1)$$

$$= 6x^4 + 15x^3 - 3x^2 - 2x^3 - 5x^2 + x + 4x^2 + 10x - 2$$

$$= 6x^4 + 13x^3 - 4x^2 + 11x - 2$$

(ii)  $(2x + 3)(x - 2)(x^2 + 1) = (2x + 3)(x^3 - 2x^2 + x - 2)$

$$= 2x(x^3 - 2x^2 + x - 2) + 3(x^3 - 2x^2 + x - 2)$$

$$= 2x^4 - 4x^3 + 2x^2 - 4x + 3x^3 - 6x^2 + 3x - 6$$

$$= 2x^4 - x^3 - 4x^2 - x - 6$$

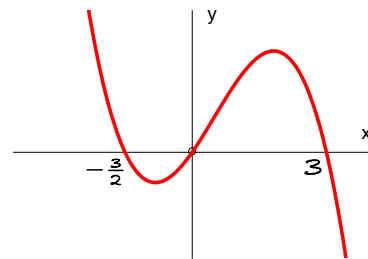
2. (i)  $y = x(3 - x)(2x + 3)$

This is a cubic graph which cuts the x-axis at  $(0, 0)$ ,  $(3, 0)$  and  $(-\frac{3}{2}, 0)$ .

When  $x = 0$ ,  $y = 0$

When  $x$  is large and positive,  $y$  is negative.

When  $x$  is large and negative,  $y$  is positive.



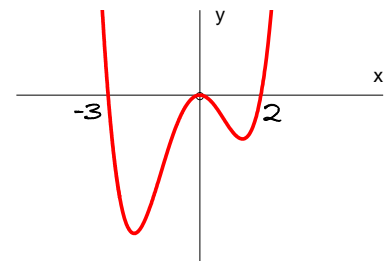
(ii)  $y = x^2(x - 2)(x + 3)$

This is a quartic graph which touches the x-axis at  $(0, 0)$  and cuts the x-axis at  $(2, 0)$  and  $(-3, 0)$ .

When  $x = 0$ ,  $y = 0$

When  $x$  is large and positive,  $y$  is positive.

When  $x$  is large and negative,  $y$  is positive.



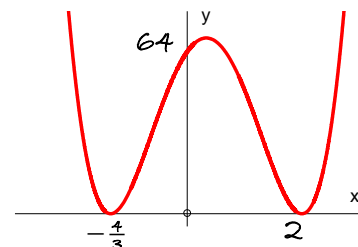
(iii)  $y = (x - 2)^2(3x + 4)^2$

This is a quartic graph which touches the x-axis at  $(2, 0)$  and  $(-\frac{4}{3}, 0)$ .

When  $x = 0$ ,  $y = 2^2 \times 4^2 = 64$

When  $x$  is large and positive,  $y$  is positive.

When  $x$  is large and negative,  $y$  is positive.



## Edexcel AS Maths Polynomials 1 Exercise solutions

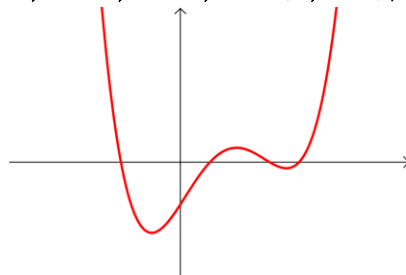
$$\begin{aligned} 3. \text{ (i) } [f(x)]^2 &= (x^2 + x + 1)(x^2 + x + 1) \\ &= x^4 + 2x^3 + 3x^2 + 2x + 1 \end{aligned}$$

$$\begin{aligned} \text{(ii) } g(x) - f(x) &= 2x^4 - x^3 + 2 - (x^2 + x + 1) \\ &= 2x^4 - x^3 + 2 - x^2 - x - 1 \\ &= 2x^4 - x^3 - x^2 - x + 1 \end{aligned}$$

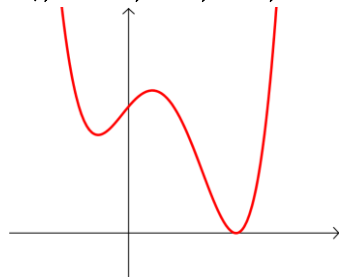
$$\begin{aligned} \text{(iii) } f(x)g(x) &= (x^2 + x + 1)(2x^4 - x^3 + 2) \\ &= 2x^6 + x^5 + x^4 - x^3 + 2x^2 + 2x + 2 \end{aligned}$$

$$\begin{aligned} \text{(iv) } f(x)(g(x) - f(x)) &= f(x)g(x) - [f(x)]^2 \\ &= (2x^6 + x^5 + x^4 - x^3 + 2x^2 + 2x + 2) \\ &\quad - (x^4 + 2x^3 + 3x^2 + 2x + 1) \\ &= 2x^6 + x^5 - 3x^3 - x^2 + 1 \end{aligned}$$

$$\begin{aligned} 4. \text{ (i) e.g. } y &= (x+2)(x-1)(x-3)(x-4) \\ &= x^4 - 6x^3 + 3x^2 + 26x - 24 \end{aligned}$$



$$\begin{aligned} \text{(ii) e.g. } y &= (x-1)^2(4x^2 + 3x + 1) \\ &= 4x^4 - 5x^3 - x^2 + x + 1 \end{aligned}$$



$$\text{(iii) e.g. } y = -8x^4 + 10x^3 + 2x^2 - 2x - 1$$

