

$$\textcircled{1} \quad P(-2) = -4 \cdot (-2)^3 + k(-2)^2 + 5(-2) - 7 = 32 + 4k - 10 - 7 = 0$$

$$4k = -15 \rightarrow k = -\frac{15}{4}$$

$$\textcircled{2} \quad P(x) + Q(x) - R(x) \cdot Q(x) =$$

$$\begin{aligned} & [5x^3 - 5x^2 + 3x - 6] + [-4x^3 + 3x^2 - 6x + 7] - [-3x^4 + 8x^2 - 5x - 6] \\ & [-4x^3 + 3x^2 - 6x + 7] = \\ & [5x^3 - 4x^3 - 5x^2 + 3x^2 + 3x - 6x - 6 + 7] - [12x^4 - 9x^6 + 18x^5 - 21x^4 \\ & - 32x^5 + 24x^4 - 48x^3 + 56x^2 + 20x^4 - 15x^3 + 30x^2 - 35x + 24x^3 - 18x^2 \\ & + 36x - 42] = \\ & [x^3 - 2x^2 - 3x + 1] - [12x^4 - 9x^6 - 14x^5 + 23x^4 - 39x^3 + 68x^2 + x - 42] = \\ & -12x^4 + 9x^6 + 14x^5 - 23x^4 + 40x^3 - 70x^2 - 4x + 43 \end{aligned}$$

$$\textcircled{3} \quad P(x) = x(x^4 - 2x^3 - 7x^2 - 20x + 12)$$

$$\textcircled{4} \quad \begin{array}{l} P(0) = 2 \rightarrow c = 2 \\ P(-1) = 10 \quad a - b + c = 10 \\ P(1) = 0 \quad a + b + c = 0 \end{array} \quad \left\{ \begin{array}{l} a - b = 8 \\ a + b = -2 \end{array} \right. \quad \left\{ \begin{array}{l} 2a = 6 \rightarrow a = 3 \\ b = -2 - a = -5 \end{array} \right.$$

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

$$\textcircled{5} \quad \begin{array}{r} 5x^6 + 4x^3 - x^2 + 3x - 7 \\ -5x^6 + \frac{5}{2}x^5 - \frac{15}{2}x^4 \\ \hline \frac{5}{2}x^5 - \frac{15}{2}x^4 + 4x^3 \\ -\frac{5}{2}x^5 + \frac{5}{4}x^4 - \frac{15}{4}x^3 \\ \hline -\frac{25}{4}x^4 + \frac{1}{4}x^3 - x^2 \\ +\frac{25}{4}x^4 - \frac{25}{8}x^3 + \frac{75}{8}x^2 \\ \hline -\frac{23}{8}x^3 + \frac{67}{8}x^2 + 3x \\ +\frac{23}{8}x^3 - \frac{23}{16}x^2 + \frac{69}{16}x \\ \hline \frac{11}{16}x^2 + \frac{117}{16}x - 7 \\ -\frac{11}{16}x^2 + \frac{11}{32}x + \frac{333}{32} \\ \hline \frac{347}{32}x - \frac{557}{32} \end{array}$$