Polynomial Long Division

①

$$
\begin{array}{r}
m^2 + m - 9 \\
m-7 \overline{\smash{)}\; m^3 - 6m^2 - 16m + 63} \\
\underline{m^3 - 7m^2} \\
1m^2 - 16m \\
\underline{1m^2 - 7m} \\
-9m + 63 \\
\underline{-9m + 63} \\
\emptyset
\end{array}
$$

②

$$
\begin{array}{r}
v^2 - 10v + 2 \\
v+8 \overline{\smash{)}\; v^3 - 2v^2 - 78v + 16} \\
\underline{v^3 + 8v^2} \\
-10v^2 - 78v \\
\underline{-10v^2 - 80v} \\
2v + 16 \\
\underline{2v + 16} \\
\emptyset
\end{array}
$$

③

$$
\begin{array}{r}
k^2 + 5k + 9 \\
k-8 \overline{\smash{)}\; k^3 - 3k^2 - 31k - 72} \\
\underline{k^3 - 8k^2} \\
5k^2 - 31k \\
\underline{5k^2 - 40k} \\
9k - 72 \\
\underline{9k - 72} \\
\emptyset
\end{array}
$$

④

$$
\begin{array}{r}
x^2 - 3x + 10 \\
x-5 \overline{\smash{)}\; x^3 - 8x^2 + 25x - 50} \\
\underline{x^3 - 5x^2} \\
-3x^2 + 25x \\
\underline{-3x^2 + 15x} \\
10x - 50 \\
\underline{10x - 50} \\
\emptyset
\end{array}
$$

⑤

$$
\begin{array}{r}
-9x^2 + 5x - 1 \\
x-9 \overline{\smash{)}\; -9x^3 + 86x^2 - 46x + 9} \\
\underline{-9x^3 + 81x^2} \\
5x^2 - 46x \\
\underline{5x - 45x} \\
-1x + 9 \\
\underline{-1x + 9} \\
\emptyset
\end{array}
$$

⑥

$$
\begin{array}{r}
n^2 \\
n+8 \overline{\smash{)}\; n^3 + 8n^2} \\
\underline{n^3 + 8n^2} \\
\emptyset
\end{array}
$$

⑦ x^2+4x+9 ; $x-1 \overline{\smash{\big)}\ x^3+3x^2+5x-9}$

$\underline{x^3-x^2}$

$4x^2+5x$

$\underline{4x^2-4x}$

$9x-9$

$\underline{9x-9}$

$\emptyset$

⑧ x^2-6x+3 ; $x+7 \overline{\smash{\big)}\ x^3+x^2-39x+21}$

$\underline{x^3+7x}$

$-6x-39x$

$\underline{-6x-42x}$

$3x+21$

$\underline{3x+21}$

$\emptyset$

⑨ x^3-2x^2-1x-4 ; $x+5 \overline{\smash{\big)}\ x^4+3x^3-11x^2-9x-20}$

$\underline{x^4+5x^3}$

$-2x^3-11x^2$

$\underline{-2x^3-10x^2}$

$-1x^2-9x$

$\underline{-1x^2-5x}$

$-4x-20$

$\underline{-4x-20}$

$\emptyset$

⑩ $7x^2-2x-6$; $x+2 \overline{\smash{\big)}\ 7x^3+12x^2-10x-12}$

$\underline{7x^3+14x^2}$

$-2x^2-10x$

$\underline{-2x^2-4x}$

$-6x-12$

$\underline{-6x-12}$

$\emptyset$

⑪ x^2+5x+6 ; $x+1 \overline{\smash{\big)}\ x^3+6x^2+11x+16}$

$\underline{x^3+x^2}$

$5x^2+11x$

$\underline{5x^2+5x}$

$6x+16$

$\underline{6x+6}$

10

⑫ x^2-8x+7 ; $x-3 \overline{\smash{\big)}\ x^3-11x^2+31x-17}$

$\underline{x^3-3x^2}$

$-8x^2+31x$

$\underline{-8x^2+24x}$

$7x-17$

$\underline{7x-21}$

4

Solution: $x^2+5x+6+\dfrac{10}{x+1}$

$x^2-8x+7+\dfrac{4}{x-3}$

⑬
$$\frac{x^2+4x+9}{x-2 \overline{\smash{\big)}\,x^3+2x^2+x-13}}$$
$$\underline{x^3-2x^2}$$
$$4x^2+x$$
$$\underline{4x^2-8x}$$
$$9x-13$$
$$\underline{9x-18}$$
$$5$$

Solution: $x^2+4x+9+\dfrac{5}{x-2}$

⑭
$$\frac{x^2+5x+3}{x-7 \overline{\smash{\big)}\,x^3-2x^2-32x-17}}$$
$$\underline{x^3-7x^2}$$
$$5x^2-32x$$
$$\underline{5x^2-35x}$$
$$3x-17$$
$$\underline{3x-21}$$
$$4$$

Solution: $x^2+5x+3+\dfrac{4}{x-7}$

⑮
$$\frac{x^2-9x+4}{x+5 \overline{\smash{\big)}\,x^3-4x^2-41x+24}}$$
$$\underline{x^3+5x^2}$$
$$-9x^2-41x$$
$$\underline{-9x^2-45x}$$
$$4x+24$$
$$\underline{4x+20}$$
$$4$$

Solution: $x^2-9x+4+\dfrac{4}{x+5}$

⑯
$$\frac{x^2+x-3}{x+10 \overline{\smash{\big)}\,x^3+11x^2+7x-37}}$$
$$\underline{x^3+10x^2}$$
$$1x^2+7x$$
$$\underline{x^2+10x}$$
$$-3x-37$$
$$\underline{-3x-30}$$
$$-7$$

Solution: $x^2+x-3-\dfrac{7}{x+10}$

⑰
$$\frac{x^4+3x^3+3x^2+5x}{x+2 \overline{\smash{\big)}\,x^5+5x^4+9x^3+11x^2+12x+13}}$$
$$\underline{x^5+2x^4}$$
$$3x^4+9x^3$$
$$\underline{3x^4+6x^3}$$
$$3x^3+11x^2$$
$$\underline{3x^3+6x^2}$$
$$5x^2+12x$$
$$\underline{5x^2+10x}$$
$$2x$$

(18)

$$\begin{array}{r} x^2-x+2 \\ x+1\overline{)\,x^3+x+2} \\ \underline{x^3+x^2} \\ -x^2+x \\ \underline{-x^2-x} \\ 2x+2 \\ \underline{2x+2} \\ \emptyset \end{array}$$

(19)

$$\begin{array}{r} 4x^2+14x+84 \\ x-6\overline{)\,4x^3-10x^2-504} \\ \underline{4x^3-24x^2} \\ 14x^2-504 \\ \underline{14x^2-84x} \\ +84x-504 \\ \underline{84x-504} \\ \emptyset \end{array}$$

(20)

$$\begin{array}{r} 2x^2-4x+5 \\ x+2\overline{)\,2x^3-3x+10} \\ \underline{2x^3+4x^2} \\ -4x^2-3x \\ \underline{-4x^2-8x} \\ 5x+10 \\ \underline{5x+10} \\ \emptyset \end{array}$$

(21)

$$\begin{array}{r} 5x^2+19x+76 \\ x-4\overline{)\,5x^3-x^2-304} \\ \underline{5x^3-20x^2} \\ 19x^2-304 \\ \underline{19x^2-76x} \\ 76x-304 \\ \underline{76x-304} \\ \emptyset \end{array}$$

(22)

$$\begin{array}{r} x^2-9x-27 \\ x-3\overline{)\,x^3-12x^2+81} \\ \underline{x^3-3x^2} \\ -9x^2+81 \\ \underline{-9x^2+27x} \\ -27x+81 \\ \underline{-27x-81} \\ \emptyset \end{array}$$

(23)

$$\begin{array}{r} x \\ x^2-5\overline{)\,x^3-5x} \\ \underline{x^2-5x} \\ \emptyset \end{array}$$