5.

$$x-2 \overline{\smash{)}\,x^2-9x-1} \quad \to \quad x-7+\frac{-15}{x-2}$$

$$\ominus \;\; x^2 \ominus 2x$$
$$\underline{}$$
$$-7x-1$$
$$\oplus -7x \ominus +14$$
$$\underline{}$$
$$-15$$

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

$-7(x-2)$
$$-7x+14$$

6.

$$x^2+3x-1 \overline{\smash{)}\,3x^4-2x+3x^3-2}$$

$$3x^2-6x+21+\frac{-71x+19}{x^2+3x-1}$$

$$x^2+3x-1 \overline{\smash{)}\,3x^4+3x^3+0x^2-2x-2}$$
$$\ominus 3x^4 \oplus +9x^3 \ominus -3x^2$$
$$\underline{}$$
$$-6x^3+3x^2-2x-2$$
$$\oplus -6x^3 \oplus -18x^2 \ominus +6x$$
$$\underline{}$$
$$21x^2-8x-2$$
$$\ominus 21x^2 \ominus +63x \oplus -21$$
$$\underline{}$$
$$-71x+19$$

* MUST BE IN STANDARD FORM
* PUT ZERO PLACE HOLDER FOR MISSING POWERS

$3x^2(x^2+3x-1)$
$$3x^4+9x^3-3x^2$$

$-6x(x^2+3x-1)$
$$-6x^3-18x^2+6x$$

$21(x^2+3x-1)$
$$21x^2+63x-21$$

7. $\dfrac{x^2-6x+8}{x-2}$

① $x-2=0$
$$x=2$$

②
$$2 \,\overline{\smash{)}\,\begin{array}{rrr} x^2 & x & \text{no }x \\ 1 & -6 & 8 \\ & 2 & -8 \end{array}}$$
$$\begin{array}{rrr} 1 & -4 & 0 \\ x & \text{no }x & \text{REM} \end{array}$$

$$\boxed{x-4}$$

ADD
MULT
ADD
MULT
ADD
MULT

8. $\dfrac{x^3-5x-2}{x+4}$

① $x+4=0$
$$x=-4$$

②
$$-4 \,\overline{\smash{)}\,\begin{array}{rrrr} x^3 & x^2 & x & \text{no }x \\ 1 & 0 & -5 & -2 \\ & -4 & 16 & -44 \end{array}}$$
$$\begin{array}{rrrr} 1 & -4 & 11 & -46 \\ x^2 & x & \text{no }x & \text{REM} \end{array}$$

$$\boxed{x^2-4x+11+\frac{-46}{x+4}}$$

9. $\dfrac{x^4-3x^2+5}{x-2}$

① $x-2=0$
$$x=2$$

②
$$2 \,\overline{\smash{)}\,\begin{array}{rrrrr} x^4 & x^3 & x^2 & x & \text{no }x \\ 1 & 0 & -3 & 0 & 5 \\ & 2 & 4 & 2 & 4 \end{array}}$$
$$\begin{array}{rrrrr} 1 & 2 & 1 & 2 & 9 \\ x^3 & x^2 & x & \text{no }x & \text{REM} \end{array}$$

$$\boxed{x^3+2x^2+x+2+\frac{9}{x-2}}$$

SYN. DIV.

CAN ONLY USE IT WHEN DIVIDING BY

$x+\#$
$x-\#$

$3x-2$
x^2-3