Example 2: $(4x^3+9x-12)\div(2x+1)$

$$
\begin{array}{r}
2x^2-x+5 \\
2x+1\,\overline{)\,4x^3+0x^2+9x-12} \\
\underline{4x^3+2x^2} \\
-2x^2+9x \\
\underline{-2x^2-x} \\
10x-12 \\
\underline{10x+5} \\
-17
\end{array}
$$

$4x^3+9x-12=(2x+1)(2x^2-x+5)-17$

OR $\dfrac{4x^3+9x-12}{2x+1}=2x^2-x+5-\dfrac{17}{2x+1}$

Ex 3: $(5x-2x^3+3+x^4)\div(1+2x+x^2)$

$$
\begin{array}{r}
x^2-4x+7 \\
x^2+2x+1\,\overline{)\,x^4-2x^3+0x^2+5x+3} \\
\underline{x^4+2x^3+x^2} \\
-4x^3-x^2+5x \\
\underline{-4x^3-8x^2-4x} \\
7x^2+9x+3 \\
\underline{7x^2+14x+7} \\
-5x-4 \leftarrow \text{remainder.}
\end{array}
$$

$5x-2x^3+3+x^4=(x^2+2x+1)(x^2-4x+7)-5x-4.$

Example 4:

Divide x^3-1 by $x-1$.

$$
\begin{array}{r}
x^2+x+1 \\
x-1 \;\overline{)\; x^3+0x^2+0x-1} \\
\underline{x^3-x^2} \\
x^2+0x \\
\underline{x^2-x} \\
x-1 \\
\underline{x-1} \\
0
\end{array}
$$

← remainder.

$\therefore (x-1)$ is a factor of (x^3-1)

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

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