Bsp. 4.12: Euklidischer Algorithmus in $\mathbb{Q}[X]$

$$f = X^4 + 2X^3 - X^2 - 4X - 2$$
$$g = X^4 + X^3 - X^2 - 2X - 2$$

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h s r

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$$\overset{h}{X^4 + 2X^3 - X^2 - 4X - 2} \qquad \overset{s}{X^4 + X^3 - X^2 - 2X - 2} \qquad r$$

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$$\underset{h}{X^4 + 2X^3 - X^2 - 4X - 2} = 1 \cdot \underset{s}{X^4 + X^3 - X^2 - 2X - 2} + \underset{r}{X^3 - 2X}$$

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$$\underset{X^4+X^3-X^2-2X-2}{\overset{h}{X^4+2X^3-X^2-4X-2}} = 1 \cdot \underset{X^3-2X}{\overset{s}{X^4+X^3-X^2-2X-2}} + \overset{r}{X^3-2X}$$

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$f = X^4 + 2X^3 - X^2 - 4X - 2$
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$$\begin{array}{ccccccccc} & & h & & & & s & & r \\ X^4 + 2X^3 - X^2 - 4X - 2 & = & 1 & \cdot & X^4 + X^3 - X^2 - 2X - 2 & + & X^3 - 2X \\ X^4 + X^3 - X^2 - 2X - 2 & = & X + 1 & \cdot & X^3 - 2X & + & X^2 - 2 \end{array}$$

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$$
\begin{array}{ccccccc}
 & h & & & s & & r \\
X^4 + 2X^3 - X^2 - 4X - 2 & = & 1 & \cdot & X^4 + X^3 - X^2 - 2X - 2 & + & X^3 - 2X \\
X^4 + X^3 - X^2 - 2X - 2 & = & X + 1 & \cdot & X^3 - 2X & + & X^2 - 2 \\
X^3 - 2X & & & & X^2 - 2 & &
\end{array}
$$

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$$
\begin{array}{ccccccccc}
 & h & & & & s & & r \\
X^4 + 2X^3 - X^2 - 4X - 2 & = & 1 & \cdot & X^4 + X^3 - X^2 - 2X - 2 & + & X^3 - 2X \\
X^4 + X^3 - X^2 - 2X - 2 & = & X + 1 & \cdot & X^3 - 2X & + & X^2 - 2 \\
X^3 - 2X & = & X & \cdot & X^2 - 2 & + & 0
\end{array}
$$

Bsp. 4.12: Euklidischer Algorithmus in $\mathbb{Q}[X]$

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$$
\begin{array}{ccccccc}
 & h & & & s & & r \\
X^4 + 2X^3 - X^2 - 4X - 2 & = & 1 & \cdot & X^4 + X^3 - X^2 - 2X - 2 & + & X^3 - 2X \\
X^4 + X^3 - X^2 - 2X - 2 & = & X + 1 & \cdot & X^3 - 2X & + & X^2 - 2 \\
X^3 - 2X & = & X & \cdot & X^2 - 2 & + & 0 \\
X^2 - 2 & & & & 0 & &
\end{array}
$$

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$$
\begin{array}{ccccccccc}
 & h & & & & s & & r \\
X^4 + 2X^3 - X^2 - 4X - 2 & = & 1 & \cdot & X^4 + X^3 - X^2 - 2X - 2 & + & X^3 - 2X \\
X^4 + X^3 - X^2 - 2X - 2 & = & X + 1 & \cdot & X^3 - 2X & + & X^2 - 2 \\
X^3 - 2X & = & X & \cdot & X^2 - 2 & + & 0 \\
X^2 - 2 & & & & 0 & &
\end{array}
$$

$\mathrm{ggT}(f, g) = X^2 - 2$