Math 45 Dividing Polynomials (5.5)

Example: $(64x^6-29)\div(4x^2-3)$

polynomial $\div$ polynomial
use long division

$$(64x^6+0x^5+0x^4+0x^3+0x^2+0x-29)$$
$$\div\,(4x^2+0x-3)$$

Write each polynomial in standard form, with placeholders for missing exponents.

$$
\begin{array}{r}
16x^4 \quad +12x^2 \quad +9 \\
4x^2+0x-3\,\overline{\smash{)}\,64x^6+0x^5+0x^4+0x^3+0x^2+0x-29} \\
-\cancel{64x^6}\mp\cancel{0x^5}\pm48x^4 \qquad\qquad\qquad\qquad \\
\hline
\cancel{48x^4}+\cancel{0x^3}+0x^2 \qquad\qquad \\
-\cancel{48x^4}\mp\cancel{0x^3}\pm36x^2 \qquad\qquad \\
\hline
\cancel{36x^2}+\cancel{0x}-29 \\
-\cancel{36x^2}\mp\cancel{0x}\pm27 \\
\hline
-2
\end{array}
$$

Remainder

Consider the first terms:

$(4x^2)\cdot(\ ?\ )=(64x^6)$

$\left.\begin{array}{l} 4\cdot(16)=64 \\ x^2\cdot(x^4)=x^6 \end{array}\right\}$ use $16x^4$.

Multiply times the divisor:

$16x^4(4x^2+0x-3)$
$=64x^6+0x^5-48x^4$

Change the signs and add.

Bring down next two terms – we need three terms because divisor has three terms $(4x^2+0x-3)$.

Repeat.

$4x^2(\quad)=48x^4$
$12x^2(4x^2+0x-3)$

Repeat.

$4x^2(\quad)=36x^2$
$9(4x^2+0x-3)$

solution $\boxed{16x^4+12x^2+9+\underbrace{\frac{-2}{4x^3-2}}}$ ← Remainder ← Divisor

(If remainder is 0, dont need this part.)