Math 45 Dividing Polynomials (5.5)

Example: $(8x^2+5)\div(1-2x)$

polynomial ÷ polynomial
use long division

$(8x^2+0x+5)\div(-2x+1)$ ← write in standard form with placeholders for missing exponents

$$\begin{array}{r} -4x:-2 \\ -2x+1\ \overline{)\ 8x^2+0x+5} \\ -8x^2\pm 4x \\ \hline 4x+5 \\ -4x\pm 2 \\ \hline 7 \end{array}$$

- Consider the first terms
  $-2x(\ ?\ ) = 8x^2$
  ↕ use $-4x$
- Multiply times divisor
  $-4x(-2x+1)$
  $= 8x^2-4x$
- change signs, add.
- Repeat:
  $-2x(\ ?\ ) = 4x$
  use -2.
- Multiply times divisor
  $-2(-2x+1)$
  $= 4x-2$

Solution

$$\boxed{-4x-2+\frac{7}{1-2x}}$$

or

$$\boxed{-4x-2+\frac{7}{-2x+1}}$$

Example: $(6x^2+9x^3+4)\div 6x$

polynomial ÷ monomial
Write separate fractions.

$$= \frac{6x^2}{6x}+\frac{9x^3}{6x}+\frac{4}{6x}$$ reduce

$$= \boxed{x+\frac{3x^2}{2}+\frac{2}{3x}}$$ write with positive exponents

Example: $(25a^3b^2c+10a^2bc^3)\div -5a^4b^2c$

polynomial ÷ monomial
Write separate fractions.

$$= \frac{25a^3b^2c}{-5a^4b^2c}+\frac{10a^2bc^3}{-5a^4b^2c}$$

$$= \boxed{\frac{-5}{a}+\frac{-2c^2}{ab}}$$

Remember: 1) Placeholders $0x^3$ are just zero.
Multiplying anything times a placeholder gives 0 — another placeholder.

2) Always line up like terms: x^2 all in one vertical column.