

Day 01 Dividing Polynomials *Mastore*

Divide a Polynomial by a Monomial: Just divide each term by the denominator and simplify.

1. $\frac{5a^2b - 15ab^3 + 10a^3b^4}{5ab}$

$$\frac{5a^2b}{5ab} - \frac{15ab^3}{5ab} + \frac{10a^3b^4}{5ab}$$

$$\boxed{a - 3b^2 + 2a^2b^3}$$

2. $\frac{24mn^6 - 40m^2n^3}{4m^2n^3}$

$$\frac{24mn^6}{4m^2n^3} - \frac{40m^2n^3}{4m^2n^3}$$

$$\boxed{\frac{6n^3}{m} - 10}$$

How to Divide Polynomials using Long Division

Example: $(2x^3 - 7x^2 - 8x + 16) \div (x - 4)$

$$\begin{array}{r} 2x^2 + x - 4 \\ x-4 \overline{) 2x^3 - 7x^2 - 8x + 16} \\ \underline{+ (-2x^3 + 8x^2)} \\ - 4x^2 - 8x \\ \underline{+ (-x^2 + 4x)} \\ - 4x + 16 \\ \underline{+ (-4x + 16)} \\ 0 \end{array}$$

$$\boxed{2x^2 + x - 4}$$

Since there is no remainder; $x-4$ is a factor!
 $(x-4)(2x^2 + x - 4) = 2x^3 - 7x^2 - 8x + 16$

How to Divide Polynomials using Synthetic Division

Example: $(2x^3 - 7x^2 - 8x + 16) \div (x - 4)$

- A. Put it in descending order (if it is not already).
- B. If there are any missing terms, write them as $0x^{(\text{power})}$
- C. Write the coefficients of each term in a row and write the value of r 2^{nd} polynomial $(x - r)$, to the left of the 1^{st} polynomial. You can find it by setting the factor equal to zero and solving for x .

$$\begin{array}{r} 4 \mid 2 \quad -7 \quad -8 \quad 16 \end{array}$$

- D. Leave one row blank and draw a horizontal line.

$$\begin{array}{r} 4 \mid 2 \quad -7 \quad -8 \quad 16 \\ \hline \end{array}$$

- E. Drop 1^{st} coefficient below line.

$$\begin{array}{r} 4 \mid 2 \quad -7 \quad -8 \quad 16 \\ \hline 2 \end{array}$$

- F. Multiply r times the 1^{st} coefficient and place result in the blank row under 2^{nd} coefficient.

$$\begin{array}{r} 4 \mid 2 \quad -7 \quad -8 \quad 16 \\ \hline 2 \\ 8 \end{array}$$

- G. Add.

$$\begin{array}{r} 4 \mid 2 \quad -7 \quad -8 \quad 16 \\ \hline 2 \\ 8 \\ 1 \end{array}$$

- H. Continue multiplying and adding until all coefficients have been used.

$$\begin{array}{r} 4 \mid 2 \quad -7 \quad -8 \quad 16 \\ \hline 2 \\ 8 \\ 1 \\ 4 \end{array}$$

- I. Write the result in descending powers of the variable beginning with a power one less than the degree of the polynomial you divided into (dividend).

$$\boxed{2x^2 + x - 4}$$

Master E

3-12: Practice Dividing Polynomials using Synthetic Division.

3. $(x^2 + 3x - 18) \div (x - 3)$

$$\begin{array}{r|rrr} 3 & 1 & 3 & -18 \\ & \downarrow & & \\ & 3 & 12 & 18 \end{array}$$

$$3x + 12 + \frac{18}{x-3}$$

↑ correct answer

4. $(4x^2 - 3x + 9) \div (x + 3)$

$$\begin{array}{r|rrr} -3 & 4 & -3 & 9 \\ & \downarrow & & \\ & 4 & -15 & 54 \end{array}$$

$$4x - 15 + \frac{54}{x+3}$$

5. $(m^2 - 3m - 7) \div (m + 2)$

$$\begin{array}{r|rrr} -2 & 1 & -3 & -7 \\ & \downarrow & & \\ & 1 & -5 & 3 \end{array}$$

$$m - 5 + \frac{3}{m+2}$$

6. $(2x^2 + x - 3) \div (x - 1)$

$$\begin{array}{r|rrr} 1 & 2 & 1 & -3 \\ & \downarrow & & \\ & 2 & 3 & 0 \end{array}$$

$$2x + 3$$

7. $(6x^3 + 5x^2 + 9) \div (x - 3)$

$$\begin{array}{r|rrrr} 3 & 6 & 5 & 0 & 9 \\ & \downarrow & & & \\ & 6 & 23 & 69 & 216 \end{array}$$

$$6x^2 + 23x + 69 + \frac{216}{x-3}$$

8. $(2x^3 - 7x^2 - x - 12) \div (x - 4)$

$$\begin{array}{r|rrrr} 4 & 2 & -7 & -1 & -12 \\ & \downarrow & & & \\ & 2 & 1 & 3 & 0 \end{array}$$

$$2x^2 + x + 3$$

9. $(x^3 - 2x + 12) \div (x + 3)$

$$\begin{array}{r|rrrr} -3 & 1 & 0 & -2 & 12 \\ & \downarrow & & & \\ & 1 & -3 & 7 & -9 \end{array}$$

$$x^2 - 3x + 7 - \frac{9}{x+3}$$

10. $(3x^4 + 2x^3 - 5) \div (x + 4)$

$$\begin{array}{r|rrrrr} -4 & 3 & 2 & 0 & 0 & -5 \\ & \downarrow & & & & \\ & 3 & -10 & 40 & -160 & 635 \end{array}$$

$$3x^3 - 10x^2 + 40x - 160 + \frac{635}{x+4}$$

11. $(6x^4 - 40x^3 + 40x^2 + 80x + 100) \div (x - 5)$

$$\begin{array}{r|rrrrr} 5 & 6 & -40 & 40 & 80 & 100 \\ & \downarrow & & & & \\ & 6 & -10 & -10 & 30 & 250 \end{array}$$

$$6x^3 - 10x^2 - 10x + 30 + \frac{250}{x-5}$$

12. $(x^3 + 125) \div (x + 5)$

$$\begin{array}{r|rrrr} -5 & 1 & 0 & 0 & 125 \\ & \downarrow & & & \\ & 1 & -5 & 25 & 0 \end{array}$$

$$x^2 - 5x + 25$$