

# Dividing Polynomials

$$\begin{array}{r}
 \textcircled{1} \quad X+4 \overline{) X^2 + 7x + 12} \\
 \textcircled{2} \quad X(x+4) \rightarrow X^2 + 4x \\
 \hline
 0 \cdot 3x + 12 \\
 \textcircled{3} \quad \phantom{0} \cdot 3x + 12 \\
 \hline
 0
 \end{array}$$

The diagram shows the long division process with numbered steps:
 

- ①: The divisor  $X+4$  is written on the left, and the quotient  $X+3$  is written above the dividend  $X^2+7x+12$ .
- ②: An arrow points from  $X(x+4)$  to the first two terms of the dividend,  $X^2+4x$ .
- ③: An arrow points from  $0 \cdot 3x + 12$  to the next two terms of the dividend,  $3x+12$ .
- ④: A downward arrow indicates the next step in the process.
- ⑤: An arrow points from  $\frac{3}{x}(x+4)$  to the final remainder,  $0$ .

① First, divide  $x$  into  $x^2$   
 (highest term in binomial into  
 highest term in polynomial)  
 $\frac{x^2}{x} = x$

② Then, multiply  $x$  by  $(x+4)$

③ subtract  $x^2+4x$  from  $x^2+7x+12$

④ Bring down  $+12$

⑤ Divide  $x$  into  $3x = \frac{3x}{x} = 3$

⑥ multiply 3 times  $(x+4)$

⑦ subtract

⑧ answer is  $x+3$

check answer

$$(x+4)(x+3) = x^2 + 7x + 12?$$

$$x^2 + 4x + 3x + 12 = x^2 + 7x + 12$$

✓

OVER →

$$\begin{array}{r}
 \phantom{X^2 + 2x - 1} \\
 \hline
 X^2 + 2x - 1 \\
 X + 5 \overline{) X^3 + 7x^2 + 9x - 2} \\
 \underline{X^3 + 5x^2} \phantom{+ 9x - 2} \\
 2x^2 + 9x \phantom{- 2} \\
 \underline{2x^2 + 10x} \phantom{- 2} \\
 -x - 2 \\
 \underline{-x - 5} \\
 3
 \end{array}$$

$x^2(x+5)$  →  $X^3 + 5x^2$   
 $2x(x+5)$  →  $2x^2 + 10x$   
 $-1(x+5)$  →  $-x - 5$

- ① Divide  $x^3$  by  $x$
- ② Multiply  $x^2$  by  $(x+5)$
- ③ subtract
- ④ Bring down  $9x$
- ⑤ Divide  $2x^2$  by  $x$
- ⑥ multiply  $2x$  by  $(x+5)$
- ⑦ subtract
- ⑧ Bring down  $-2$
- ⑨ Divide  $x$  into  $-x$
- ⑩ Multiply  $-1$  by  $(x+5)$
- ⑪ subtract
- ⑫ stop since  $x$  can't divide into  $3$

Answer  $(X^2 + 2x - 1 \text{ R } 3)$

Check answer

$$(x+5)(x^2 + 2x - 1) + 3$$

Remainder

$$x^3 + 2x^2 + x + 5x^2 + 10x - 5$$

$$x^3 + 7x^2 + 9x - 5 + 3$$

$$x^3 + 7x^2 + 9x - 2$$