

Dividing Polynomials (Answers)

1. $x^3 - 5x^2 - x - 10$ by $x - 2$

$$\begin{array}{r}
 x^2 - 3x - 7 \\
 x - 2 \overline{) x^3 - 5x^2 - x - 10} \\
 \underline{x^3 - 2x^2} \quad \downarrow \quad \downarrow \\
 -3x^2 - x \quad \downarrow \\
 \underline{-3x^2 + 6x} \quad \downarrow \\
 -7x - 10 \\
 \underline{-7x + 14} \\
 -24
 \end{array}$$

Result: $(x - 2)(x^2 - 3x - 7) - 24$

3. $y^3 - 28y - 41$ by $y + 4$

$$\begin{array}{r}
 y^2 - 4y - 12 \\
 y + 4 \overline{) y^3} \quad -28y - 41 \\
 \underline{y^3 + 4y^2} \quad \downarrow \quad \downarrow \\
 -4y^2 - 28y \quad \downarrow \\
 \underline{-4y^2 - 16y} \quad \downarrow \\
 -12y - 41 \\
 \underline{-12y - 48} \\
 7
 \end{array}$$

Result: $(y + 4)(y^2 - 4y - 12) + 7$

extra $\rightarrow (y + 4)(y + 2)(y - 6) + 7$

5. $-6x^3 + 29x^2 + 7x - 13$ by $2x - 1$

$$\begin{array}{r}
 -3x^2 + 13x + 10 \\
 2x - 1 \overline{) -6x^3 + 29x^2 + 7x - 13} \\
 \underline{-6x^3 + 3x^2} \quad \downarrow \quad \downarrow \\
 26x^2 + 7x \quad \downarrow \\
 \underline{26x^2 - 13x} \quad \downarrow \\
 20x - 13 \\
 \underline{20x - 10} \\
 -3
 \end{array}$$

Result: $(2x - 1)(-3x^2 + 13x + 10) - 3$

extra $\rightarrow (2x - 1)(-3x - 2)(x - 5) - 3$

2. $2y^3 + y^2 - 27y - 36$ by $y + 3$

$$\begin{array}{r}
 2y^2 - 5y - 12 \\
 y + 3 \overline{) 2y^3 + y^2 - 27y - 36} \\
 \underline{2y^3 + 6y^2} \quad \downarrow \quad \downarrow \\
 -5y^2 - 27y \quad \downarrow \\
 \underline{-5y^2 - 15y} \quad \downarrow \\
 -12y - 36 \\
 \underline{-12y - 36} \\
 0
 \end{array}$$

Result: $(y + 3)(2y^2 - 5y - 12)$

extra $\rightarrow (y + 3)(2y + 3)(y - 4)$

4. $2x^3 - 3x^2 - 8x - 3$ by $2x + 1$

$$\begin{array}{r}
 x^2 - 2x - 3 \\
 2x + 1 \overline{) 2x^3 - 3x^2 - 8x - 3} \\
 \underline{2x^3 + x^2} \quad \downarrow \quad \downarrow \\
 -4x^2 - 8x \quad \downarrow \\
 \underline{-4x^2 - 2x} \quad \downarrow \\
 -6x - 3 \\
 \underline{-6x - 3} \\
 0
 \end{array}$$

Result: $(2x + 1)(x^2 - 2x - 3)$

extra $\rightarrow (2x + 1)(x + 1)(x - 3)$

6. $y^3 + 4y^2 - 3y - 12$ by $y + 4$

$$\begin{array}{r}
 y^2 - 3 \\
 y + 4 \overline{) y^3 + 4y^2 - 3y - 12} \\
 \underline{y^3 + 4y^2} \quad \downarrow \quad \downarrow \\
 0 - 3y - 12 \\
 \underline{-3y - 12} \\
 0
 \end{array}$$

Result: $(y + 4)(y^2 - 3)$

extra $\rightarrow (y + 4)(y + \sqrt{3})(y - \sqrt{3})$

More Dividing Polynomials (Answers)

Complete the exercises below:

1. Find each quotient and remainder:

(a) $(x^2+6x+15) \div (x+3)$

$$\begin{array}{r} -3 \overline{) \begin{array}{rrr} 1 & 6 & 15 \\ \downarrow & -3 & -9 \\ 1 & 3 & 6 \end{array}} \end{array}$$

Quotient = $x+3$ Rem = 6

(b) $(x^2-4x+13) \div (x-2)$

$$\begin{array}{r} 2 \overline{) \begin{array}{rrr} 1 & -4 & 13 \\ \downarrow & 2 & -4 \\ 1 & -2 & 9 \end{array}} \end{array}$$

$Q = x-2$

$R = 9$

(c) $(x^2-x+3) \div (x+2)$

$$\begin{array}{r} -2 \overline{) \begin{array}{rrr} 1 & -1 & 3 \\ \downarrow & -2 & 6 \\ 1 & -3 & 9 \end{array}} \end{array}$$

$Q = x-3$ $R = 9$

(d) $(2x^3+x^2-24x-32) \div (x-4)$

$$\begin{array}{r} 4 \overline{) \begin{array}{rrrr} 2 & 1 & -24 & -32 \\ \downarrow & 8 & 36 & 48 \\ 2 & 9 & 12 & 16 \end{array}} \end{array}$$

$Q = 2x^2+9x+12$

$R = 16$

2. When a certain polynomial is divided by $x+3$, the quotient is x^2-3x+5 and the remainder is 6. What is the polynomial?

$$f(x) = (x^2-3x+5)(x+3) + 6$$

$$= x^3 + 3x^2 - 3x^2 - 9x + 5x + 15 + 6 = x^3 - 4x + 21$$

3. When a certain polynomial is divided by $x-2$, the quotient is x^2+4x-7 and the remainder is -4 . What is the polynomial?

$$f(x) = (x^2+4x-7)(x-2) - 4$$

$$= x^3 - 2x^2 + 4x^2 - 8x - 7x + 14 - 4 = x^3 + 2x^2 - 15x + 10$$

4. Divide:

(a) $(x^3+3x^2-4x-12) \div (x-2)$

$$\begin{array}{r} 2 \overline{) \begin{array}{rrrr} 1 & 3 & -4 & -12 \\ \downarrow & 2 & 10 & 12 \\ 1 & 5 & 6 & 0 \end{array}} \end{array}$$

$\therefore f(x) = (x^2+5x+6)(x-2) + 0$

(b) $(3x^3+2x^2-11x-12) \div (x+1)$

$$\begin{array}{r} -1 \overline{) \begin{array}{rrrr} 3 & 2 & -11 & -12 \\ \downarrow & -3 & 1 & 10 \\ 3 & -1 & -10 & -2 \end{array}} \end{array}$$

$\therefore f(x) = (3x^2-x-10)(x+1) - 2$

(c) $(2x^3+x^2-24x-32) \div (x-4)$

$$\begin{array}{r} 4 \overline{) \begin{array}{rrrr} 2 & 1 & -24 & -32 \\ \downarrow & 8 & 36 & 48 \\ 2 & 9 & 12 & 16 \end{array}} \end{array}$$

$\therefore f(x) = (2x^2+9x+12)(x-4) + 16$

(d) $(2x^3+3x^2-14x-13) \div (x-3)$

$$\begin{array}{r} 3 \overline{) \begin{array}{rrrr} 2 & 3 & -14 & -13 \\ \downarrow & 6 & 27 & 39 \\ 2 & 9 & 13 & 26 \end{array}} \end{array}$$

$\therefore f(x) = (2x^2+9x+13)(x-3) + 26$