

Dividing Polynomials

Complete the polynomial division questions below:

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

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

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

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

[*note: $y^3 - 28y - 41 = y^3 + 0y^2 - 28y - 41$]

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

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

More Dividing Polynomials

Complete the exercises below:

1. Find each quotient and remainder:

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

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

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

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

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?

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?

4. Divide:

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

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

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

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

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

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

Quotient = $x+3$ Rem = 6

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

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

Q = $x-3$ R = 9

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

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

Q = $x-2$
R = 9

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

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

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

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

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

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

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

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

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

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

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

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

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

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