Synthetic Division with Polynomials (ALG.POL.07)

Divide using synthetic division.

1. $(7x^4 - 18x^3 + 14x^2 - 23x + 22) \div (x - 2)$ $\mathbf{7x^3 - 4x^2 + 6x - 11}$

2. $(3x^5 - 9x^4 + 8x^3 - 24x^2 - 3x + 9) \div (x - 3)$ $\mathbf{3x^4 + 8x^2 - 3}$

3. $(x^5 + 5x^4 - 6x^3 - x - 6) \div (x + 6)$ $\mathbf{x^4 - x^3 - 1}$

4. $(x^7 + 5x^6 - x^4 - 5x^3 - 12x - 60) \div (x + 5)$ $\mathbf{x^6 - x^3 - 12}$

5. $(3x^4 - 10x^3 - 8x^2 - 2) \div (x - 4)$ $\mathbf{3x^3 + 2x^2 - \frac{2}{x-4}}$

6. $(2x^4 - 4x^3 - 11x^2 + 3x + 6) \div (x + 1)$ $\mathbf{2x^3 - 6x^2 - 5x + 8 - \frac{2}{x+1}}$

7. $(8x^5 - 56x^4 + 5x^2 - 35x + 17) \div (x - 7)$ $\mathbf{8x^4 + 5x + \frac{17}{x-7}}$

8. $\left(x^3 + (1 - \sqrt{2})x^2 + (-12 - \sqrt{2})x + 12\sqrt{2}\right) \div (x - \sqrt{2})$ $\mathbf{x^2 + x - 12}$

9. $\left(2x^4 + (1 - 4\sqrt{6})x^3 - 3x^2 + 6\sqrt{6}x - 48\sqrt{6}\right) \div (x - 2\sqrt{6})$ $\mathbf{2x^3 + x^2 + (2\sqrt{6} - 3)x + 24}$

10. $\left(3x^3 + (13 - 3\sqrt{3})x^2 + (13 - 7\sqrt{3})x + \sqrt{3} - 2\right) \div (x + 2 - \sqrt{3})$ $\mathbf{3x^2 + 7x - 1}$

Divide using the extended version of synthetic division.

11. $(10x^4 - 6x^3 - 40x^2 + 59x - 21) \div (5x - 3)$ $\mathbf{2x^3 - 8x + 7}$

12. $(4x^4 - 9x^2 + 2) \div (2x - 3)$ $\mathbf{2x^3 + 3x^2 + \frac{2}{2x-3}}$

13. $(21x^5 + 56x^4 - 9x^3 - 24x^2 + 6x + 16) \div (3x + 8)$ $\mathbf{7x^4 - 3x^2 + 2}$

14. $(16x^3 + 42x^2 - 45x + 17) \div (2x + 7)$ $\mathbf{8x^2 - 7x + 2 + \frac{3}{2x+7}}$

15. $(16x^3 - 8x^2 - 3x + 1) \div (4x - \sqrt{3})$ $\mathbf{4x^2 + (\sqrt{3} - 2)x - \frac{\sqrt{3}}{2} - \frac{1}{8x-2\sqrt{3}}}$

16. $(18x^3 + 6\sqrt{5}x^2 - 32x - 15) \div (3x - 4 + \sqrt{5})$ $\mathbf{6x^2 + 8x - \frac{8\sqrt{5}}{3} - \frac{5+32\sqrt{5}}{9x-12+3\sqrt{5}}}$

Write the function in the form $f(x) = (x - k) \cdot q(x) + r$ for the given value of k.

17. $f(x) = 4x^3 - 17x^2 + 16x - 1, \quad k = 3$ $\quad f(x) = (x - 3)(4x^2 - 5x + 1) + 2$

18. $f(x) = 7x^4 + 49x^3 - 5x^2 - 33x + 10, \quad k = -7$ $\quad f(x) = (x + 7)(7x^3 - 5x + 2) - 4$

19. $f(x) = 5x^4 - 2x^3 - 10x^2 + 16x - 4, \quad k = \frac{2}{5}$ $\quad f(x) = \left(x - \frac{2}{5}\right)(5x^3 - 10x + 12) + \frac{4}{5}$

20. $f(x) = 6x^3 + 10x^2 - 9x - 13, \quad k = -\frac{5}{3}$ $\quad f(x) = \left(x + \frac{5}{3}\right)(6x^2 - 9) + 2$

21. $f(x) = x^3 + 5x^2 - 3x - 17, \quad k = \sqrt{3}$ $\quad f(x) = \left(x - \sqrt{3}\right)\left(x^2 + \left(5 + \sqrt{3}\right)x + 5\sqrt{3}\right) - 2$

22. $f(x) = 4x^3 + 5x^2 + \left(40 + 10\sqrt{10}\right)x + 410\sqrt{10}, \quad k = -2\sqrt{10}$

$f(x) = \left(x + 2\sqrt{10}\right)\left(4x^2 + \left(5 - 8\sqrt{10}\right)x + 200\right) + 10\sqrt{10}$

23. $f(x) = 3x^3 - 6x^2 - 15x + 9\sqrt{5} - 24, \quad k = 2 - \sqrt{5}$

$f(x) = \left(x - 2 + \sqrt{5}\right)\left(3x^2 - 3\sqrt{5}x - 6\sqrt{5}\right) + 6 - 3\sqrt{5}$

24. $f(x) = 5x^4 + 7x^3 - 71x^2 + 47x - 75, \quad k = -1 - \sqrt{15}$

$f(x) = \left(x + 1 + \sqrt{15}\right)\left(5x^3 + \left(2 - 5\sqrt{15}\right)x^2 + \left(2 + 3\sqrt{15}\right)x - 5\sqrt{15}\right) + 5\sqrt{15}$