

Dividing Polynomials 3 - Synthetic Division SOLUTIONS

The different sign of the number in the box is assumed. All added zeros are shown, and remainders are shown when they are not equal to 0.

$$1. (x^3 + 7x^2 + 5x - 21) \div (x + 3)$$

$$\begin{array}{r|rrrr} -3 & 1 & 7 & 5 & -21 \\ & & -3 & -12 & 21 \\ \hline & 1 & 4 & -7 & 0 \end{array}$$

$$x^2 + 4x - 7$$

$$2. (x^4 - 2x^3 - 12x^2 + 19x - 12) \div (x - 4)$$

$$\begin{array}{r|rrrrrr} 4 & 1 & -2 & -12 & 19 & -12 \\ & & 4 & 8 & -16 & 12 \\ \hline & 1 & 2 & -4 & 3 & 0 \end{array}$$

$$x^3 + 2x^2 - 4x + 3$$

$$3. (x^4 + 6x^3 + x^2 - 25x + 12) \div (x + 4)$$

$$\begin{array}{r|rrrrr} -4 & 1 & 6 & 1 & -25 & 12 \\ & & -4 & -8 & 28 & -12 \\ \hline & 1 & 2 & -7 & 3 & 0 \end{array}$$

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

$$4. (x^4 - 9x^3 + 15x^2 - 7x) \div (x - 7)$$

$$\begin{array}{r|rrrrr} (x^4 - 9x^3 + 15x^2 - 7x + 0) \div (x - 7) \\ 7 & 1 & -9 & 15 & -7 & 0 \\ & & 7 & -14 & 7 & 0 \\ \hline & 1 & -2 & 1 & 0 & 0 \end{array}$$

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

$$5. (x^5 - 6x^4 + x^3 - 13x^2 + 48x - 36) \div (x - 6)$$

$$\begin{array}{r|rrrrrr} 6 & 1 & -6 & 1 & -13 & 48 & -36 \\ & & 6 & 0 & 6 & -42 & 36 \\ \hline & 1 & 0 & 1 & -7 & 6 & 0 \end{array}$$

$$x^4 + 0x^3 + x^2 - 7x + 6$$

$$= x^4 + x^2 - 7x + 6$$

$$6. (x^5 + 8x^4 + 10x^3 + 3x^2 + 8x - 12) \div (x + 2)$$

$$\begin{array}{r|rrrrr} -2 & 1 & 8 & 10 & 3 & 8 & -12 \\ & & -2 & -12 & 4 & -14 & 12 \\ \hline & 1 & 6 & -2 & 7 & -6 & 0 \end{array}$$

$$x^4 + 6x^3 - 2x^2 + 7x - 6$$

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7. $(x^4 - 8x^3 + x^2 - 5x - 24) \div (x - 8)$

$$\begin{array}{r|rrrrrr} 8 & 1 & -8 & 1 & -5 & -24 \\ & & 8 & 0 & 8 & 24 \\ \hline & 1 & 0 & 1 & 3 & 0 \end{array}$$

$$\begin{aligned} x^3 + 0x^2 + x + 3 \\ = x^3 + x + 3 \end{aligned}$$

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

$$\begin{array}{r|rrrrrr} 3 & 1 & -2 & -2 & -2 & -3 \\ & & 3 & 3 & 3 & 3 \\ \hline & 1 & 1 & 1 & 1 & 0 \end{array}$$

$$x^3 + x^2 + x + 1$$

9. $(x^6 + 7x^5 + 5x^4 - 27x^3 - 3x^2 - 24x + 16) \div (x + 4)$

$$\begin{array}{r|rrrrrrrr} -4 & 1 & 7 & 5 & -27 & -3 & -24 & 16 \\ & & -4 & -12 & 28 & -4 & 28 & -16 \\ \hline & 1 & 3 & -7 & 1 & -7 & 4 & 0 \end{array}$$

$$x^5 + 3x^4 - 7x^3 + x^2 - 7x + 4$$

10. $(x^3 - 2x^2 - 29x - 42) \div (x - 7)$

$$\begin{array}{r|rrrr} 7 & 1 & -2 & -29 & -42 \\ & & 7 & 35 & 42 \\ \hline & 1 & 5 & 6 & 0 \end{array}$$

$$x^2 + 5x + 6$$

11. $(x^4 + 3x^3 - 2x^2 + 13x - 7) \div (x + 4)$

$$\begin{array}{r|rrrrrr} -4 & 1 & 3 & -2 & 13 & -7 \\ & & -4 & 4 & -8 & -20 \\ \hline & 1 & -1 & 2 & 5 & -27 \end{array}$$

$$\begin{aligned} x^3 - x^2 + 2x + 5 + \frac{-27}{x+4} \\ = x^3 - x^2 + 2x + 5 - \frac{27}{x+4} \end{aligned}$$

12. $(x^4 + 3x^3 + 2x^2 + 7x + 6) \div (x + 3)$

$$\begin{array}{r|rrrrr} -3 & 1 & 3 & 2 & 7 & 6 \\ & & -3 & 0 & -6 & -3 \\ \hline & 1 & 0 & 2 & 1 & 3 \end{array}$$

$$\begin{aligned} x^3 + 0x^2 + 2x + 1 + \frac{3}{x+3} \\ = x^3 + 2x + 1 + \frac{3}{x+3} \end{aligned}$$

13. $(x^4 + 3x^3 - x^2 + 7x - 6) \div (x - 2)$

$$\begin{array}{r|rrrrr} 2 & 1 & 3 & -1 & 7 & -6 \\ & & 2 & 10 & 18 & 50 \\ \hline & 1 & 5 & 9 & 25 & 44 \end{array}$$

$$x^3 + 5x^2 + 9x + 25 + \frac{44}{x-2}$$

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14. $(x^5 - 2x^4 + 7x^3 - 2x^2 + 13x - 19) \div (x - 1)$

$$\begin{array}{r|rrrrrrr} 1 & 1 & -2 & 7 & -2 & 13 & -19 \\ & & 1 & -1 & 6 & 4 & 17 \\ \hline & 1 & -1 & 6 & 4 & 17 & -2 \end{array}$$

$$x^4 - x^3 + 6x^2 + 4x + 17 + \frac{-2}{x-1}$$

$$= x^4 - x^3 + 6x^2 + 4x + 17 - \frac{2}{x-1}$$

15. $(x^4 + 8x^3 + 5x^2 - 74x - 119) \div (x + 4)$

$$\begin{array}{r|rrrrrr} -4 & 1 & 8 & 5 & -74 & -119 \\ & & -4 & -16 & 44 & 120 \\ \hline & 1 & 4 & -11 & -30 & 1 \end{array}$$

$$x^3 + 4x^2 - 11x - 30 + \frac{1}{x+4}$$

16. $(x^2 + x - 7) \div (x + \frac{1}{2})$

$$\begin{array}{r|rrr} -\frac{1}{2} & 1 & 1 & -7 \\ & & -\frac{1}{2} & -\frac{1}{4} \\ \hline & 1 & \frac{1}{2} & -7\frac{1}{4} \end{array}$$

$$x + \frac{1}{2} + \frac{-7\frac{1}{4}}{x+\frac{1}{2}}$$

$$= x + \frac{1}{2} - \frac{29}{4x+2}$$

17. $(\frac{2}{3}x^3 + \frac{7}{4}x^2 + \frac{21}{3}x + 1) \div (x - \frac{1}{3})$

$$\begin{array}{r|rrrrr} \frac{1}{3} & \frac{2}{3} & \frac{7}{4} & \frac{21}{3} & 1 \\ & & \frac{2}{9} & \frac{55}{108} & \frac{2103}{972} \\ \hline & \frac{2}{3} & \frac{55}{36} & \frac{701}{108} & -\frac{377}{324} \end{array}$$

$$\frac{2}{3}x^2 + \frac{55}{36}x + \frac{701}{108} + \frac{-\frac{377}{324}}{x-\frac{1}{3}}$$

$$= \frac{2}{3}x^2 + 1\frac{19}{36}x + 6\frac{53}{108} - \frac{377}{324x-108}$$

18. $(9x^4 + 12x^3 + 7x^2 - 19x - 14) \div (3x + 2)$

$$= \frac{(9x^4 + 12x^3 + 7x^2 - 19x - 14) \div (3x + 2)}{3}$$

$$= (3x^4 + 4x^3 + \frac{7}{3}x^2 - \frac{19}{3}x - \frac{14}{3}) \div (x + \frac{2}{3})$$

$$\begin{array}{r|rrrrr} -\frac{2}{3} & 3 & 4 & \frac{7}{3} & -\frac{19}{3} & -\frac{14}{3} \\ & & -2 & -\frac{4}{3} & -\frac{2}{3} & \frac{14}{3} \\ \hline & 3 & 2 & 1 & -7 & 0 \end{array}$$

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

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$$\begin{aligned}
 19. & (2x^4 + 9x^3 + 24x^2 + 23x - 30) \div (2x + 5) \\
 &= \frac{(2x^4 + 9x^3 + 24x^2 + 23x - 30) \div (2x + 5)}{2} \\
 &= \left(x^4 + \frac{9}{2}x^3 + 12x^2 + \frac{23}{2}x - 15\right) \div \left(x + \frac{5}{2}\right) \\
 &\quad \begin{array}{r|rrrrr}
 -\frac{5}{2} & 1 & \frac{9}{2} & 12 & \frac{23}{2} & -15 \\
 & & -\frac{5}{2} & -5 & -\frac{35}{2} & 15 \\
 \hline
 & 1 & 2 & 7 & -6 & 0
 \end{array} \\
 & x^3 + 2x^2 + 7x - 6
 \end{aligned}$$

$$\begin{aligned}
 20. & (3x^4 + 5x^3 + 3x^2 - 16x + 35) \div (3x + 5) \\
 &= \frac{(3x^4 + 5x^3 + 3x^2 - 16x + 35) \div (3x + 5)}{3} \\
 &= \left(x^4 + \frac{5}{3}x^3 + x^2 - \frac{16}{3}x + \frac{35}{3}\right) \div \left(x + \frac{5}{3}\right) \\
 &\quad \begin{array}{r|rrrrr}
 -\frac{5}{3} & 1 & \frac{5}{3} & 1 & -\frac{16}{3} & \frac{35}{3} \\
 & & -\frac{5}{3} & 0 & -\frac{5}{3} & -\frac{35}{3} \\
 \hline
 & 1 & 0 & 1 & -7 & 0
 \end{array} \\
 & x^3 + 0x^2 + x - 7 \\
 &= x^3 + x - 7
 \end{aligned}$$

$$\begin{aligned}
 21. & (x^3 + x - 7) \div (x + 4) \\
 &= (x^3 + 0x^2 + x - 7) \div (x + 4) \\
 &\quad \begin{array}{r|rrrr}
 -4 & 1 & 0 & 1 & -7 \\
 & & -4 & 16 & -68 \\
 \hline
 & 1 & -4 & 17 & -75
 \end{array} \\
 & x^2 - 4x + 17 + \frac{-75}{x+4} \\
 &= x^2 - 4x + 17 - \frac{75}{x+4}
 \end{aligned}$$

$$\begin{aligned}
 22. & (2x^3 - 5x^2 + x - 28) \div (2x - 7) \\
 &= \frac{(2x^3 - 5x^2 + x - 28) \div (2x - 7)}{2} \\
 &= \left(x^3 - \frac{5}{2}x^2 + \frac{1}{2}x - 14\right) \div \left(x - \frac{7}{2}\right) \\
 &\quad \begin{array}{r|rrrr}
 \frac{7}{2} & 1 & -\frac{5}{2} & \frac{1}{2} & -14 \\
 & & \frac{7}{2} & \frac{7}{2} & 14 \\
 \hline
 & 1 & 1 & 4 & 0
 \end{array} \\
 & x^2 + x + 4
 \end{aligned}$$

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$$\begin{aligned}
 23. & (x^4 - 3x^2 + 7x - 16) \div (x - 5) \\
 &= (x^4 + 0x^3 - 3x^2 + 7x - 16) \div (x - 5) \\
 &\quad \begin{array}{r|rrrrrr}
 5 & 1 & 0 & -3 & 7 & -16 \\
 & & 5 & 25 & 110 & 585 \\
 \hline
 & 1 & 5 & 22 & 117 & 569
 \end{array} \\
 & x^3 + 5x^2 + 22x + 117 + \frac{569}{x-5}
 \end{aligned}$$

$$\begin{aligned}
 24. & (x^5 - x^2 + 3x - 7) \div (x + 3) \\
 &= (x^5 + 0x^4 + 0x^3 - x^2 + 3x - 7) \div (x + 3) \\
 &\quad \begin{array}{r|rrrrrrr}
 -3 & 1 & 0 & 0 & -1 & 3 & -7 \\
 & & -3 & 9 & -27 & 84 & -261 \\
 \hline
 & 1 & -3 & 9 & -28 & 87 & -268
 \end{array} \\
 & x^4 - 3x^3 + 9x^2 - 28x + 87 + \frac{-268}{x+3} \\
 &= x^4 - 3x^3 + 9x^2 - 28x + 87 - \frac{268}{x+3}
 \end{aligned}$$

$$\begin{aligned}
 25. & (3x^5 + 25x^4 + 28x^3 + 2x^2 - \frac{28}{3}x - 16) \div (3x + 4) \\
 &= \frac{(3x^5 + 25x^4 + 28x^3 + 2x^2 - \frac{28}{3}x - 16) \div (3x + 4)}{3} \\
 &= (x^5 + \frac{25}{3}x^4 + \frac{28}{3}x^3 + \frac{2}{3}x^2 - \frac{28}{9}x - \frac{16}{3}) \div (x + \frac{4}{3}) \\
 &\quad \begin{array}{r|rrrrrr}
 -\frac{4}{3} & 1 & \frac{25}{3} & \frac{28}{3} & \frac{2}{3} & -\frac{28}{9} & -\frac{16}{3} \\
 & & -\frac{4}{3} & -\frac{28}{3} & 0 & -\frac{8}{9} & \frac{16}{3} \\
 \hline
 & 1 & 7 & 0 & \frac{2}{3} & -4 & 0
 \end{array} \\
 & x^4 + 7x^3 + 0x^2 + \frac{2}{3}x - 4 \\
 &= x^4 + 7x^3 + \frac{2}{3}x - 4
 \end{aligned}$$

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$$\begin{aligned}
 26. & (3x^5 - 2x^4 + 7x^2 + 6) \div (x + 3) \\
 &= (3x^5 - 2x^4 + 0x^3 + 7x^2 + 0x + 6) \div (x + 3) \\
 &\quad \begin{array}{r|rrrrrrr}
 -3 & 3 & -2 & 0 & 7 & 0 & 6 & \\
 & & -9 & 33 & -99 & 276 & -828 & \\
 \hline
 & 3 & -11 & 33 & -92 & 276 & -822 &
 \end{array} \\
 & 3x^4 - 11x^3 + 33x^2 - 92x + 276 + \frac{-822}{x+3} \\
 &= 3x^4 - 11x^3 + 33x^2 - 92x + 276 - \frac{822}{x+3}
 \end{aligned}$$

$$\begin{aligned}
 27. & (5x^3 + 2x^2 - 7) \div (4x + 3) \\
 &= \frac{(5x^3 + 2x^2 + 0x - 7) \div (4x + 3)}{4} \\
 &= \left(\frac{5}{4}x^3 + \frac{1}{2}x^2 + 0x - \frac{7}{4}\right) \div \left(x + \frac{3}{4}\right) \\
 &\quad \begin{array}{r|rrrr}
 -\frac{3}{4} & \frac{5}{4} & \frac{1}{2} & 0 & -\frac{7}{4} \\
 & & -\frac{15}{16} & \frac{21}{64} & -\frac{63}{256} \\
 \hline
 & \frac{5}{4} & -\frac{7}{16} & \frac{21}{64} & -\frac{511}{256}
 \end{array} \\
 & \frac{5}{4}x^2 - \frac{7}{16}x + \frac{21}{64} + \frac{-511}{256x + \frac{3}{4}} \\
 &= \frac{5}{4}x^2 - \frac{7}{16}x + \frac{21}{64} - \frac{\frac{511}{256}}{x + \frac{3}{4}} \\
 &= \frac{5}{4}x^2 - \frac{7}{16}x + \frac{21}{64} - \frac{511}{256x + 192}
 \end{aligned}$$