

LESSON **4.2** Skills Practice

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The Great Polynomial Divide
Polynomial Division**Vocabulary**

Write an example for each term. Write the dividend as the product of the divisor and the quotient plus the remainder.

1. Polynomial long division

2. Synthetic division

4**Problem Set**

Write the zero that corresponds to each factor.

1. $x + 5$
 $x = -5$

2. $x - 12$

3. $2x + 1$

4. $10x - 9$

5. $x - 13$

6. $3x + 4$

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Write the factor that corresponds to each zero.

7. $x = 2$
 $x - 2$

8. $x = -7$

9. $x = -75$

10. $x = \frac{2}{3}$

11. $x = -\frac{3}{8}$

12. $x = \frac{5}{4}$

Determine if the given factor is a factor of each polynomial. Explain your reasoning.

13. Is $x - 1$ a factor of $x^4 - 3x^3 + 6x^2 - 12x + 8$?

$$\begin{array}{r}
 x^3 - 2x^2 + 4x - 8 \\
 x - 1 \overline{) x^4 - 3x^3 + 6x^2 - 12x + 8} \\
 \underline{x^4 - x^3} \\
 -2x^3 + 6x^2 \\
 \underline{-2x^3 + 2x^2} \\
 4x^2 - 12x \\
 \underline{4x^2 - 4x} \\
 -8x + 8 \\
 \underline{-8x + 8} \\
 0
 \end{array}$$

Yes, $x - 1$ is a factor of $x^4 - 3x^3 + 6x^2 - 12x + 8$ because it divides into the polynomial without a remainder.

14. Is $x - 1$ a factor of $x^4 + 6x^3 - 12x^2 - 38x - 21$?

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15. Is $3x + 2$ a factor of
 $3x^5 + 20x^4 + 9x^3 - 92x^2 - 60x$?

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16. Is $x - 3$ a factor of
 $x^3 + 12x^2 + 17x - 30$?

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17. Is $x + 4$ a factor of
 $2x^3 + 7x^2 - 10x - 24$?

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18. Is $x + 2$ a factor of
 $x^4 - 2x^3 - x^2 - 4x - 6$?

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Determine each quotient using polynomial long division. Write the dividend as the product of the divisor and the quotient plus the remainder.

19. $x - 4 \overline{)2x^3 - 7x^2 - 19x + 60}$

$$\begin{array}{r}
 2x^2 + x - 15 \\
 x - 4 \overline{)2x^3 - 7x^2 - 19x + 60} \\
 \underline{2x^3 - 8x^2} \\
 x^2 - 19x \\
 \underline{x^2 - 4x} \\
 -15x + 60 \\
 \underline{-15x + 60} \\
 0
 \end{array}$$

$2x^3 - 7x^2 - 19x + 60 = (x - 4)(2x^2 + x - 15)$



20. $x - 2 \overline{)2x^3 - x^2 - 13x - 6}$

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21. $x + 3 \overline{)x^3 + 8x^2 + 7x + 5}$

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22. $x + 2 \overline{)3x^3 + 5x^2 - 2x}$

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23. $x + 1 \overline{)4x^2 + 9x^3 - 82x^2 - 57x + 18}$

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24. $x - 3 \overline{)x^4 + 5x^3 - 33x^2 + 27x}$

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Determine each quotient using synthetic division. Write the dividend as the product of the divisor and the quotient plus the remainder.

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

$$\begin{array}{r|rrrrr} 3 & 1 & 8 & -3 & -24 & 0 \\ & & 3 & 33 & 90 & 108 \\ \hline & 1 & 11 & 30 & 66 & 108 \end{array}$$

$$x^4 + 8x^3 - 3x^2 - 24x = (x - 3)\left(x^3 + 11x^2 + 30x + 66\right) + \frac{108}{x - 3}$$

26. $(x^4 - 3x^3 + 6x^2 - 12x + 8) \div (x - 1)$

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27. $(2x^3 + 21x^2 + 22x - 45) \div (2x + 5)$

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28. $(x^3 + x^2 - 16x - 16) \div (x + 2)$

29. $(x^4 - 6x^3 - 19x^2 + 24x) \div (x + 3)$

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30. $(x^4 + 5x^3 - 33x^2 + 27x) \div (x - 9)$