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Module 11 Simplifying Algebraic Expressions with Polynomials

Lesson 7 Dividing Polynomials Using Long Division

independent practice

Use long division to divide these polynomials. Assume that no divisor is equal to zero.

1. $x - 2\overline{)3x^2 - 7x + 2}$

$\mathbf{3x - 1}$

2. $2c + 3\overline{)2c^2 + 7c + 6}$

$\mathbf{c + 2}$

3. $5y + 2\overline{)5y^2 + 7y + 9}$

$\mathbf{y + 1 + \frac{7}{5y + 2}}$

4. $4a - 7\overline{)4a^2 + 5a - 24}$

$\mathbf{a + 3 + \frac{-3}{4a - 7}}$

5. $(x^2 + 5x + 4) \div (x + 4)$

$\mathbf{x + 1}$

6. $(a^2 - 9a + 14) \div (a - 2)$

$\mathbf{a - 7}$

7. $(y^2 + 9y - 12) \div (y - 1)$

$\mathbf{y + 10 + \frac{-2}{y - 1}}$

8. $(b^2 + 4b - 9) \div (b + 6)$

$\mathbf{b - 2 + \frac{3}{b + 6}}$

9. $(-8n + 3n^2 + 4) \div (n - 2)$

$\mathbf{3n - 2}$

10. $(21 - 26c + 8c^2) \div (2c - 3)$

$\mathbf{4c - 7}$

11. $(6 + m^2 + 6m) \div (m + 5)$

$\mathbf{m + 1 + \frac{1}{m + 5}}$

12. $(12s^2 + 23s + 13) \div (2 + 3s)$

$\mathbf{4s + 5 + \frac{3}{3s + 2}}$

13. $(6d^3 - 11d^2 - 7d + 2) \div (3d + 2)$

$\mathbf{2d^2 - 5d + 1}$

14. $(4x^3 + 20x^2 + 3x - 55) \div (2x + 5)$

$\mathbf{2x^2 + 5x - 11}$

15. $(x^2 - 64) \div (x - 8)$

$\mathbf{x + 8}$

16. $(a^2 - 25) \div (5 + a)$

$\mathbf{a - 5}$

17. $(a^3 - 8) \div (a - 2)$

$\mathbf{a^2 + 2a + 4}$

18. $(8c^3 + 27) \div (2c + 3)$

$\mathbf{4c^2 - 6c + 9}$

19. $(y^3 + 125) \div (y - 2)$

$\mathbf{y^2 + 2y + 4 + \frac{133}{y - 2}}$

20. $(18r^4 + 9r^3 + 3r^2) \div (3r^2 + 1)$

$\mathbf{6r^2 + 3r - 1 + \frac{-3r + 1}{3r^2 + 1}}$

Journal

1. In the equation $(r^2 - 5r + 6) \div (r - 3) = r - 2$, why is it important to know that $r \neq 3$?
2. Why is it important to arrange both the dividend and the divisor in order of decreasing degree of the variable for long division?
3. Explain how to rewrite the dividend in the following problem in order to divide by using long division: $(27a^3 - 8) \div (3a - 2)$. Why would you do this?
4. Explain the process used to check the problem below to make sure the answer is correct.

$$3x + 1 \overline{\smash{)}12x^2 + 13x + 7} \quad = 4x + 3 + \frac{4}{3x + 1}$$

5. Is the answer correct in "Journal Question 4"? Show all work to justify your answer.

Cumulative Review

1. Simplify: $8^5 \cdot 8^{-3}$.

   64

2. Write 1.98×10^8 in standard form.

   198,000,000

3. Write 0.004 m in scientific notation.

   4×10^{-3} m

4. Add: $(a^3 - 2a - 1) + (3a + 7)$.

   $a^3 + a + 6$

5. Multiply: $3x^4 \cdot -4x^2$

   $-12x^6$

6. Multiply: $4d(3d^2 - 6d)$.

   $12d^3 - 24d^2$

7. Multiply: $(2r + 4)^2$.

   $4r^2 + 16r + 16$

8. Multiply: $(3y - 5)(2y^2 + 7y - 4)$.

   $6y^3 + 11y^2 - 47y + 20$

9. Simplify: $\frac{15x^3yz^6}{-3x^2z^3}$.

   $-5xyz^3$

10. Simplify: $\frac{-24g^9 - 4g^5 + 32g^3}{8g^2}$.

    $-3g^7 - \frac{1}{2}g^3 + 4g$

Possible Journal Answers

1. If r were equal to three, then the divisor, $r - 3$, would be equal to zero. In that case, $(r^2 - 5r + 6) \div (r - 3)$ would be "undefined" rather than $r - 2$.

2. It is important to arrange both the dividend and the divisor in order of decreasing degree of the variable so that the like terms will line up when long division is performed. When like terms are lined up, it is much easier to combine them.

3. Rewrite the dividend as $27a^3 + 0a^2 + 0a - 8$ in order to supply the missing a^2 and a terms. This provides spaces for the terms of the resulting polynomial.

4. You would multiply the divisor, $3x + 1$, by the partial quotient, $4x + 3$, and then, add the remainder, four. If the result is the same as the dividend, $12x^2 + 13x + 7$, then you know the answer is correct.

5. Yes, it is correct. $(3x + 1)(4x + 3) = 12x^2 + 9x + 4x + 3 = 12x^2 + 13x + 3$. When the remainder, four, is added, the result is $12x^2 + 13x + 7$, which is the same as the dividend.