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7.1 Reteach

A **monomial** is a number, a variable, or the product of a number and one or more variables with whole number exponents.

The **degree of a monomial** is the sum of the exponents of the variables in the monomial. The degree of a nonzero constant term is 0. The constant 0 does not have a degree.

EXAMPLE Finding the Degree of a Monomial

Find the degree of $-2x^2y^3$.

SOLUTION

The exponent of x is 2, and the exponent of y is 3.

▶ So, the degree of the monomial is $2 + 3$, or 5.

Key Idea

Polynomials

A **polynomial** is a monomial or a sum of monomials. Each monomial is called a *term* of the polynomial. A polynomial with two terms is a **binomial**. A polynomial with three terms is a **trinomial**.

Binomial	Trinomial
$5x + 2$	$x^2 + 5x + 2$

The **degree of a polynomial** is the greatest degree of its terms. A polynomial in one variable is in **standard form** when the exponents of the terms decrease from left to right. When you write a polynomial in standard form, the coefficient of the first term is the **leading coefficient**.

$$\overset{\text{leading coefficient}}{2}x^{\overset{\text{degree}}{3}} + x^2 - 5x + \overset{\text{constant term}}{12}$$

EXAMPLE Writing a Polynomial in Standard Form

Write $-4x^2 + 5x^3 - 1$ in standard form. Identify the degree and leading coefficient of the polynomial.

SOLUTION

Consider the degree of each term of the polynomial.

$$\overset{\text{Degree is 2.}}{-4x^2} + \overset{\text{Degree is 3.}}{5x^3} - \overset{\text{Degree is 0.}}{1}$$

▶ You can write the polynomial in standard form as $5x^3 - 4x^2 - 1$. The greatest degree is 3, so the degree of the polynomial is 3, and the leading coefficient is 5.

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7.1 Reteach (continued)

A set of numbers is **closed** under an operation when the operation performed on any two numbers in the set results in a number that is also in the set. For example, the set of integers is closed under addition, subtraction, and multiplication. This means that if a and b are two integers, then $a + b$, $a - b$, and ab are also integers.

The set of polynomials is closed under addition and subtraction. So, the sum or difference of any two polynomials is also a polynomial.

To add polynomials, add like terms. You can use a vertical or a horizontal format.

To subtract a polynomial, add its opposite. To find the opposite of a polynomial, multiply each of its terms by -1.

EXAMPLE Adding and Subtracting Polynomials

Find (a) $(5w^3 - 2w^2 + w) + (4w^2 - 2w^3 - 5)$ and (b) $(5q^2 - 2) - (-3q^2 + 4q - 3)$.

SOLUTION

a. Align like terms vertically and add.

$$\begin{array}{r} 5w^3 - 2w^2 + w \\ + (-2w^3 + 4w^2 - 5) \\ \hline 3w^3 + 2w^2 + w - 5 \end{array}$$

▶ The sum is $3w^3 + 2w^2 + w - 5$.

b. $(5q^2 - 2) - (-3q^2 + 4q - 3)$

$= (5q^2 - 2) + (3q^2 - 4q + 3)$	Find the opposite of $-3q^2 + 4q - 3$ by multiplying each term by -1.
$= (5q^2 + 3q^2) - 4q + (-2 + 3)$	Group like terms.
$= 8q^2 - 4q + 1$	Simplify.

▶ The difference is $8q^2 - 4q + 1$.

In Exercises 1–3, find the degree of the monomial.

1. $7n^3$ **2.** $\frac{1}{3}x^5$ **3.** w^2y^5

In Exercises 4–6, write the polynomial in standard form. Identify the degree and leading coefficient of the polynomial.

4. $6v^7$ **5.** $10 + 4p^3$ **6.** $5h - 4h^3 - 2$

In Exercises 7–10, find the sum or difference.

7. $(3j^2 - 7j + 1) + (-6j^2 - 4j + 9)$ **8.** $(2w^2 - 7w + 3) + (2w^2 + 8w)$

9. $(3y^2 - 6y + 9) - (6y^2 - 7y - 2)$ **10.** $(5b^2 - 6b - 9) - (-2b^2 + 8b - 1)$

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7.1 Puzzle Time

Find the sum or difference.

1. $(6x + 5) + (-3x + 7)$

2. $(-9x - 13) + (8x + 3)$

3. $(2x - 8) - (4x - 2)$

4. $(5x + 8) - (6x + 2)$

5. $(3x^2 - 6x - 7) + (-2x^2 - 4x + 12)$

6. $(-x^2 - 5x + 8) - (4x^2 - 7x - 10)$

7. $(6x^2 - 3x + 10) - (-6x^2 + 11x + 9)$

8. $(-13x^3 + 15x^2 - 12x) + (-x^3 - 4x^2 - 15x + 1)$

9. $(7x^3 - x + 14) - (2x^2 - 19)$

10. $(8x - 3x^3 - 5) + (4x^3 - 6x^2 + 11)$

11. $(-5x - 16) - (-3x^3 + 2x^2 + 9x)$

12. The amount of merchandise (in millions) that store A sold is represented by $A = 13x^2 + 8x - 3$. The amount of merchandise (in millions) that store B sold is represented by $B = 8x^2 - 3x + 11$. Write a polynomial that represents the total amount of merchandise that stores A and B sold.

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7.1 Extra Practice

In Exercises 1–3, find the degree of the monomial.

1. $-3.25n^8$

2. $\frac{1}{5}x^4yz^2$

3. uv^3w^9

In Exercises 4–6, write the polynomial in standard form. Identify the degree and leading coefficient of the polynomial. Then classify the polynomial by the number of terms.

4. $3t - 8t^2 + 10t^5$

5. $\frac{2}{9}n^2 - \pi n + 3n^4$

6. $\sqrt{14}p^5$

7. The monthly profit for a small company is represented by $250x^5 - 42x^2 + 112x$, where x is the number of beds sold. Classify the polynomial by the number of terms. Then identify the degree.

In Exercises 8–11, find the sum.

8. $\left(-2t^2 - 7t + 5\right) + \left(-8t^2 + 4t - 3\right)$

9. $\left(8y^2 - 2y + 4\right) + \left(5y^2 - 7y\right)$

10. $\left(3k - 5k^3 + 9\right) + \left(8k^3 - 4k + 8\right)$

11. $\left(\frac{3}{2}q^2 - 7q - 6\right) + \left(2q^2 - \frac{5}{3}q^3 + 8q\right)$

In Exercises 12–15, find the difference.

12. $\left(t^3 - 5t^2 - 7\right) - \left(t - 11\right)$

13. $\left(-w - 13\right) - \left(-3w^3 + w^2 + 6w\right)$

14. $\left(x^4 - x^2 + 9\right) - \left(13 - 6x^2 + 8x\right)$

15. $\left(4.5g - 5g^3 + 6g^2\right) - \left(7.3g^3 + 9g - 10\right)$

16. The number of economy-size cars rented in w weeks is represented by $152 + 3w$. The number of full-size cars rented in w weeks is represented by $99 + 2w$. Write a polynomial that represents how many more economy cars are rented in w weeks than full-size cars.

In Exercises 17 and 18, find the sum or difference.

17. $\left(g^2 - 9h^2\right) + \left(g^2 - 15gh + 8h^2\right)$

18. $\left(-m^2 - 5mn\right) - \left(m^2 + 3mn - 9n^2\right)$

19. A ball is dropped from a height of 30 feet. At the same time, a ball is thrown straight into the air from a height of 5 feet with an initial velocity of 20 feet per second. The polynomials $-16t^2 + 30$ and $-16t^2 + 20t + 5$ represent the heights (in feet) of the balls after t seconds.

a. Write a polynomial that represents the distance between the heights of the balls after t seconds.

b. Interpret any coefficients and constants of the polynomial in part (a).