

Concept and Vocabulary Check:

1. The product rule for exponents states that $b^m \cdot b^n =$ _____. When multiplying exponential expressions with the same base, _____ the exponents.
2. The power rule for exponents states that $(b^m)^n =$ _____. When an exponential expression is raised to a power, _____ the exponents.
3. The products-to-powers rule for exponents states that $(ab)^n =$ _____. When a product is raised to a power, raise each _____ to the power.
4. To multiply $2x^2(x^2 + 5x + 7)$, use the _____ property to multiply each term of the polynomial _____ by the monomial _____.
5. To multiply $(4x + 7)(x^2 + 8x + 3)$, begin by multiplying each term of $x^2 + 8x + 3$ by _____. Then multiply each term of $x^2 + 8x + 3$ by _____. Then combine _____ terms.

Practice Exercises:

In exercises 1 - 7, multiply each expression using the product rule.

1. $x^{15} \cdot x^3$

5. $x^2 \cdot x^6 \cdot x^3$

3. $y \cdot y^{11}$

7. $7^9 \cdot 7^{10}$

In exercises 9 - 23, simplify each expression.

9. $(6^9)^{10}$

13. $[(-20)^3]^3$

11. $(x^{15})^3$

15. $(2x)^3$

17. $(-5x)^2$

21. $(-2y^6)^4$

19. $(4x^3)^2$

23. $(-2x^7)^5$

In exercises 25 - 97, multiply the polynomials.

25. $(7x)(2x)$

39. $2x(x - 6)$

29. $(-5y^4)(3y^3)$

41. $-4y(3y + 5)$

31. $\left(-\frac{1}{2}a^3\right)\left(-\frac{1}{4}a^2\right)$

45. $2y^2(y^2 + 3y)$

33. $(2x^2)(-3x)(8x^4)$

47. $2y^2(3y^2 - 4y + 7)$

35. $4x(x + 3)$

49. $(3x^3 + 4x^2)(2x)$

51. $(x^2 + 5x - 3)(-2x)$

71. $(2a - 3)(a^2 - 3a + 5)$

59. $(x + 3)(x - 5)$

73. $(x + 1)(x^3 + 2x^2 + 3x + 4)$

63. $(2x - 5)(x + 4)$

75. $\left(x - \frac{1}{2}\right)(4x^3 - 2x^2 + 5x - 6)$

65. $\left(\frac{1}{4}x + 4\right)\left(\frac{3}{4}x - 1\right)$

77. $(x^2 + 2x + 1)(x^2 - x + 2)$

67. $(x + 1)(x^2 + 2x + 3)$

97. $(y + 1)(y^2 - y + 1) + (y - 1)(y^2 + y + 1)$

Applications:

101. Find a trinomial for the area of the rectangular rug shown on page 358, whose sides are $x + 5$ feet and $2x - 3$ feet.

- 103) a. Express the area of the large rectangle on page 359, as the product of two binomials.
- b. Find the sum of the areas of the four smaller rectangles.
- c. Use polynomial multiplication to show that your expressions for area in parts (a) and (b) are equal.

Critical Thinking:

105. Explain the product rule for exponents. Use $2^3 \cdot 2^5$ in your explanation.
121. Find a polynomial, in descending powers of x that represents the area of the shaded region of the figure on page 359.