

□ DIAGNOSTIC TESTS

Test A Algebra

1. (a) $(-3)^4 = (-3)(-3)(-3)(-3) = 81$

(c) $3^{-4} = \frac{1}{3^4} = \frac{1}{81}$

(e) $(\frac{2}{3})^{-2} = (\frac{3}{2})^2 = \frac{9}{4}$

(b) $-3^4 = -(3)(3)(3)(3) = -81$

(d) $\frac{5^{23}}{5^{21}} = 5^{23-21} = 5^2 = 25$

(f) $16^{-3/4} = \frac{1}{16^{3/4}} = \frac{1}{(\sqrt[4]{16})^3} = \frac{1}{2^3} = \frac{1}{8}$

2. (a) Note that $\sqrt{200} = \sqrt{100 \cdot 2} = 10\sqrt{2}$ and $\sqrt{32} = \sqrt{16 \cdot 2} = 4\sqrt{2}$. Thus $\sqrt{200} - \sqrt{32} = 10\sqrt{2} - 4\sqrt{2} = 6\sqrt{2}$.

(b) $(3a^3b^3)(4ab^2)^2 = 3a^3b^3 16a^2b^4 = 48a^5b^7$

(c) $\left(\frac{3x^{3/2}y^3}{x^2y^{-1/2}}\right)^{-2} = \left(\frac{x^{3/2}y^{-1/2}}{3x^{3/2}y^3}\right)^2 = \frac{(x^{3/2}y^{-1/2})^2}{(3x^{3/2}y^3)^2} = \frac{x^3y^{-1}}{9x^3y^6} = \frac{x^3}{9x^3y^6y} = \frac{x}{9y^7}$

3. (a) $3(x+6) + 4(2x-5) = 3x+18+8x-20 = 11x-2$

(b) $(x+3)(4x-5) = 4x^2-5x+12x-15 = 4x^2+7x-15$

(c) $(\sqrt{a} + \sqrt{b})(\sqrt{a} - \sqrt{b}) = (\sqrt{a})^2 - \sqrt{a}\sqrt{b} + \sqrt{a}\sqrt{b} - (\sqrt{b})^2 = a - b$

Or: Use the formula for the difference of two squares to see that $(\sqrt{a} + \sqrt{b})(\sqrt{a} - \sqrt{b}) = (\sqrt{a})^2 - (\sqrt{b})^2 = a - b$.

(d) $(2x+3)^2 = (2x+3)(2x+3) = 4x^2+6x+6x+9 = 4x^2+12x+9$

Note: A quicker way to expand this binomial is to use the formula $(a+b)^2 = a^2 + 2ab + b^2$ with $a = 2x$ and $b = 3$.

$(2x+3)^2 = (2x)^2 + 2(2x)(3) + 3^2 = 4x^2 + 12x + 9$

(e) See Reference Page 1 for the binomial formula $(a+b)^2 = a^2 + 2ab + b^2$. Using it, we get

$(x+2)^3 = x^3 + 3x^2(2) + 3x(2^2) + 2^3 = x^3 + 6x^2 + 12x + 8$.

4. (a) Using the difference of two squares formula, $a^2 - b^2 = (a+b)(a-b)$, we have

$4x^2 - 25 = (2x)^2 - 5^2 = (2x+5)(2x-5)$.

(b) Factoring by trial and error, we get $2x^2 + 5x - 12 = (2x-3)(x+4)$.

(c) Using factoring by grouping and the difference of two squares formula, we have

$x^3 - 3x^2 - 4x + 12 = x^2(x-3) - 4(x-3) = (x^2-4)(x-3) = (x-2)(x+2)(x-3)$.

(d) $x^3 + 27x = x(x^2 + 27) = x(x+3)(x^2 - 3x + 9)$

This last expression was obtained using the sum of two cubes formula, $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$ with $a = x$ and $b = 3$. [See Reference Page 1 in the textbook.]

(e) The smallest exponent on x is $-\frac{1}{2}$, so we will factor out $x^{-1/2}$.

$3x^{3/2} - 6x^{1/2} + 6x^{-1/2} = 3x^{-1/2}(x^2 - 3x + 2) = 3x^{-1/2}(x-1)(x-2)$

(f) $x^2y - 4xy = xy(x^2 - 4) = xy(x-2)(x+2)$

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Huangqi Zhang



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Table of Contents Essential Calculus 2nd Edition Soluti

1. Understanding the eBook Essential Calculus 2nd Edition Soluti
 - The Rise of Digital Reading Essential Calculus 2nd Edition Soluti
 - Advantages of eBooks Over Traditional Books
2. Identifying Essential Calculus 2nd Edition Soluti
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Essential Calculus 2nd Edition Soluti
 - User-Friendly Interface
4. Exploring eBook Recommendations from Essential Calculus 2nd Edition Soluti
 - Personalized Recommendations
 - Essential Calculus 2nd Edition Soluti User Reviews and Ratings
 - Essential Calculus 2nd Edition Soluti and Bestseller Lists
5. Accessing Essential Calculus 2nd Edition Soluti Free and Paid eBooks
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- Essential Calculus 2nd Edition Soluti Budget-Friendly Options
- 6. Navigating Essential Calculus 2nd Edition Soluti eBook Formats
 - ePub, PDF, MOBI, and More
 - Essential Calculus 2nd Edition Soluti Compatibility with Devices
 - Essential Calculus 2nd Edition Soluti Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Essential Calculus 2nd Edition Soluti
 - Highlighting and Note-Taking Essential Calculus 2nd Edition Soluti
 - Interactive Elements Essential Calculus 2nd Edition Soluti
- 8. Staying Engaged with Essential Calculus 2nd Edition Soluti
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Essential Calculus 2nd Edition Soluti
- 9. Balancing eBooks and Physical Books Essential Calculus 2nd Edition Soluti
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Essential Calculus 2nd Edition Soluti
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Essential Calculus 2nd Edition Soluti
 - Setting Reading Goals Essential Calculus 2nd Edition Soluti
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Essential Calculus 2nd Edition Soluti
 - Fact-Checking eBook Content of Essential Calculus 2nd Edition Soluti
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
- 14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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