Introductory Algebra
Problem Set 5.4
Solutions to Every
Odd-Numbered Problem

Name _____

Date _____

5.4 The Difference of Two Squares

1. Factoring the binomial: $x^2 - 9 = (x + 3)(x - 3)$

3. Factoring the binomial: $a^2 - 36 = (a + 6)(a - 6)$

5. Factoring the binomial: $x^2 - 49 = (x + 7)(x - 7)$

7. Factoring the binomial: $4a^2 - 16 = 4(a^2 - 4) = 4(a + 2)(a - 2)$

9. The expression $9x^2 + 25$ cannot be factored.

11. Factoring the binomial: $25x^2 - 169 = (5x + 13)(5x - 13)$

13. Factoring the binomial: $9a^2 - 16b^2 = (3a + 4b)(3a - 4b)$

15. Factoring the binomial: $9 - m^2 = (3 + m)(3 - m)$

17. Factoring the binomial: $25 - 4x^2 = (5 + 2x)(5 - 2x)$

19. Factoring the binomial: $2x^2 - 18 = 2(x^2 - 9) = 2(x + 3)(x - 3)$

21. Factoring the binomial: $32a^2 - 128 = 32(a^2 - 4) = 32(a + 2)(a - 2)$

23. Factoring the binomial: $8x^2y - 18y = 2y(4x^2 - 9) = 2y(2x + 3)(2x - 3)$

25. Factoring the binomial: $a^4 - b^4 = (a^2 + b^2)(a^2 - b^2) = (a^2 + b^2)(a + b)(a - b)$

27. Factoring the binomial: $16m^4 - 81 = (4m^2 + 9)(4m^2 - 9) = (4m^2 + 9)(2m + 3)(2m - 3)$

29. Factoring the binomial: $3x^3y - 75xy^3 = 3xy(x^2 - 25y^2) = 3xy(x + 5y)(x - 5y)$

31. Factoring the trinomial: $x^2 - 2x + 1 = (x - 1)(x - 1) = (x - 1)^2$

33. Factoring the trinomial: $x^2 + 2x + 1 = (x + 1)(x + 1) = (x + 1)^2$

35. Factoring the trinomial: $a^2 - 10a + 25 = (a - 5)(a - 5) = (a - 5)^2$

37. Factoring the trinomial: $y^2 + 4y + 4 = (y + 2)(y + 2) = (y + 2)^2$

39. Factoring the trinomial: $x^2 - 4x + 4 = (x - 2)(x - 2) = (x - 2)^2$

41. Factoring the trinomial: $m^2 - 12m + 36 = (m - 6)(m - 6) = (m - 6)^2$

43. Factoring the trinomial: $4a^2 + 12a + 9 = (2a + 3)(2a + 3) = (2a + 3)^2$

45. Factoring the trinomial: $49x^2 - 14x + 1 = (7x - 1)(7x - 1) = (7x - 1)^2$

47. Factoring the trinomial: $9y^2 - 30y + 25 = (3y - 5)(3y - 5) = (3y - 5)^2$

49. Factoring the trinomial: $x^2 + 10xy + 25y^2 = (x + 5y)(x + 5y) = (x + 5y)^2$

51. Factoring the trinomial: $9a^2 + 6ab + b^2 = (3a + b)(3a + b) = (3a + b)^2$

53. Factoring the trinomial: $3a^2 + 18a + 27 = 3(a^2 + 6a + 9) = 3(a + 3)(a + 3) = 3(a + 3)^2$

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55. Factoring the trinomial:
$$2x^2 + 20xy + 50y^2 = 2(x^2 + 10xy + 25y^2) = 2(x + 5y)(x + 5y) = 2(x + 5y)^2$$

57. Factoring the trinomial:
$$5x^3 + 30x^2y + 45xy^2 = 5x(x^2 + 6xy + 9y^2) = 5x(x + 3y)(x + 3y) = 5x(x + 3y)^2$$

59. Factoring by grouping: $x^2 + 6x + 9 - y^2 = (x + 3)^2 - y^2 = (x + 3 + y)(x + 3 - y)$

61. Factoring by grouping: $x^2 + 2xy + y^2 - 9 = (x + y)^2 - 9 = (x + y + 3)(x + y - 3)$

63. Since $(x + 7)^2 = x^2 + 14x + 49$, the value is $b = 14$.

65. Since $(x + 5)^2 = x^2 + 10x + 25$, the value is $c = 25$.

67. **a.** Subtracting square areas, the area is $x^2 - 4^2 = x^2 - 16$.

    b. Factoring: $x^2 - 16 = (x + 4)(x - 4)$

    c. The square can be rearranged to be a rectangle with dimensions $x - 4$ by $x + 4$. Cut off the right "flap", then place it along the bottom of the left rectangle to produce the desired rectangle.

69. The area is $a^2 - b^2 = (a + b)(a - b)$.

71. **a.** Multiplying: $1^3 = 1$ **b.** Multiplying: $2^3 = 8$

    c. Multiplying: $3^3 = 27$ **d.** Multiplying: $4^3 = 64$

    e. Multiplying: $5^3 = 125$

73. **a.** Multiplying: $x(x^2 - x + 1) = x^3 - x^2 + x$ **b.** Multiplying: $1(x^2 - x + 1) = x^2 - x + 1$

    c. Multiplying:
$$(x + 1)(x^2 - x + 1) = x(x^2 - x + 1) + 1(x^2 - x + 1) = x^3 - x^2 + x + x^2 - x + 1 = x^3 + 1$$

75. **a.** Multiplying: $x(x^2 - 2x + 4) = x^3 - 2x^2 + 4x$

    b. Multiplying: $2(x^2 - 2x + 4) = 2x^2 - 4x + 8$

    c. Multiplying:
$$\begin{aligned}(x + 2)(x^2 - 2x + 4) &= x(x^2 - 2x + 4) + 2(x^2 - 2x + 4) \\ &= x^3 - 2x^2 + 4x + 2x^2 - 4x + 8 \\ &= x^3 + 8\end{aligned}$$

77. **a.** Multiplying: $x(x^2 - 3x + 9) = x^3 - 3x^2 + 9x$

    b. Multiplying: $3(x^2 - 3x + 9) = 3x^2 - 9x + 27$

    c. Multiplying:
$$\begin{aligned}(x + 3)(x^2 - 3x + 9) &= x(x^2 - 3x + 9) + 3(x^2 - 3x + 9) \\ &= x^3 - 3x^2 + 9x + 3x^2 - 9x + 27 \\ &= x^3 + 27\end{aligned}$$