

Unless otherwise specified, final answers are to be written with simplified and reduced fractions and/or radicals. All work is to be completed on a separate paper, properly identify it with the section and problem number. All work should be done in pencil only.

Section I: Factoring

Factor completely, looking for a common factor.

$$\begin{array}{llll}
 1. \quad 5x - 15 & 2. \quad 5x^3 - 20x & 3. \quad yz^3 - 3yz^2 + 2yz & 4. \quad 2x(x+3) - 5(x+3) \\
 5(x-3) & 5x(x-2)(x+2) & yz(z-2)(z-1) & (2x-5)(x+3)
 \end{array}$$

Factor the difference of two squares.

$$\begin{array}{llll}
 5. \quad z^2 - 49 & 6. \quad 9y^2 - 16 & 7. \quad 64 - 25y^2 & 8. \quad 16 - (x+2)^2 \\
 (z-7)(z+7) & (3y-4)(3y+4) & (8-5y)(8+5y) & (x+6)(-x+2)
 \end{array}$$

Factor the perfect square trinomial.

$$\begin{array}{lll}
 9. \quad 4z^2 - 4z + 1 & 10. \quad 36x^2 + 12x + 1 & 11. \quad 9z^2 - 24z + 16 \\
 (2z-1)^2 & (6x+1)^2 & \text{---}
 \end{array}$$

Factor the sum or difference of two cubes.

$$\begin{array}{lll}
 12. \quad y^3 - 8 & 13. \quad z^3 + 64 & 14. \quad 27x^3 - 8 \\
 (y-2)(y^2+2y+4) & (z+4)(z^2-4z+16) & (3x-2)(9x^2+6x+4)
 \end{array}$$

Factor the trinomial into two binomial factors.

$$\begin{array}{lll}
 15. \quad 12x^2 + 11x - 15 & 16. \quad 2x^2 - 3xy + y^2 & 17. \quad 6x^2 + 11xy - 10y^2 \\
 (4x-3)(3x+5) & (2x-y)(x-y) & (3x-2y)(2x+5y)
 \end{array}$$

Factor by grouping.

$$\begin{array}{lll}
 18. \quad x^3 - 4x^2 + 5x - 20 & 19. \quad 2x^3 - 3x^2 + 2x - 3 & 20. \quad x^6 + 2x^4 + x^2 + 2 \\
 (x^2+5)(x-4) & (x^2+1)(2x-3) & (x^4+1)(x^2+2)
 \end{array}$$

Factor the polynomial expression completely.

$$\begin{array}{lll}
 21. \quad x^3 - x & 22. \quad 4y^3 - 20y^2 + 25y & 23. \quad 2x^3 - 16x^2 + 14x \\
 x(x+1)(x-1) & y(2y-5)^2 & 2x(x-7)(x-1) \\
 24. \quad 12x^2 + 22x - 20 & 25. \quad 3x^4 + 24x & 26. \quad 2(5x+1) - 18 \\
 2(3x-2)(2x+5) & 3x(x+2)(x^2-2x+4) & 2(5x-8) \\
 27. \quad 3x^2 + 13xy - 10y^2 & 28. \quad 16y - y^3 & 29. \quad x^3 - 3x^2 - 4x + 12 \\
 (3x-2y)(x+5y) & y(4-y)(4+y) & (x+2)(x-2)(x-3)
 \end{array}$$

Section II: Rational Expressions

Reduce and simplify each expression.

$$30. \frac{2y^2 + 6y}{4y + 12} \quad \frac{y}{2}$$

$$31. \frac{x^2 + 6x + 9}{x^2 - x - 12} \quad \frac{x+3}{x-4}$$

$$32. \frac{z^2 - 3z}{9 - z^2} \quad \frac{-z}{z+3}$$

$$33. \frac{y^2 - y - 30}{y^2 - 3y - 18} \quad \frac{y+5}{y+3}$$

$$34. \frac{y^3 + 4y^2 - 21y}{y^2 - 49} \quad \frac{y(y-3)}{y-7}$$

$$35. \frac{8x^3 - 1}{2x^2 + 5x - 3} \quad \frac{4x^2 + 2x + 1}{x+3}$$

Simplify each rational expression with only positive exponents.

$$36. \frac{3}{x-1} \cdot \frac{x^2 - 1}{9} \quad \frac{x+1}{3}$$

$$37. \frac{x+3}{7} \cdot \frac{14}{2x+6} \quad 1$$

$$38. \frac{x+3}{x-1} \cdot \frac{1-x}{x^2-9} \quad \frac{-1}{x-3}$$

$$39. \frac{18x^2 - 3x}{3xy} \cdot \frac{12y^2}{6x-1} \quad 12y$$

$$40. \frac{x^3 - 1}{2x^2} \cdot \frac{4x}{x^2 + x + 1} \quad \frac{2(x-1)}{x}$$

$$41. \frac{4x}{y} \div \frac{8y}{x} \quad \frac{x^2}{2y^2}$$

Simplify the compound fraction.

$$42. \frac{\frac{x}{y^2} - \frac{y}{x^2}}{\frac{1}{y^2} - \frac{1}{x^2}} \quad \frac{x^2 + xy + y^2}{x+y}$$

$$43. \frac{2x + \frac{13x-3}{x-4}}{2x + \frac{x+3}{x-4}} \quad \frac{x+3}{x-3}$$

$$44. \frac{\frac{1}{(x+h)^2} - \frac{1}{x^2}}{h} \quad \frac{-2x-h}{x^2(x+h)^2}$$

$$45. \frac{\frac{b}{a} - \frac{a}{b}}{\frac{1}{a} - \frac{1}{b}} \quad b+a$$

Section III: Linear, Quadratic and Radical Equations

Solve each linear equation with an algebraic solution.

$$46. \frac{1}{3}x + \frac{1}{4} = 1$$
$$x = 9/4$$

$$47. \frac{2x-3}{4} + 3 = 3x$$
$$x = 9/10$$

$$48. 2x - 4 = \frac{4x-5}{3}$$
$$x = 7/2$$

$$49. \frac{t-1}{3} + \frac{t+5}{4} = \frac{1}{2}$$
$$t = -5/7$$

$$50. \frac{t+5}{8} - \frac{t-2}{2} = \frac{1}{3}$$
$$t = 31/9$$

Solve the quadratic equation by extracting square roots. Simplify radicals without decimals.

$$51. 4x^2 = 25$$
$$x = \pm 5/2$$

$$52. 2(x-5)^2 = 17$$
$$x = 5 \pm \frac{\sqrt{34}}{2}$$

$$53. 3(x+3)^2 + 7 = 25$$
$$x = -3 \pm \sqrt{6}$$

$$54. 2y^2 - 8 = 6 - 2y^2$$
$$y = \pm \sqrt{14}/2$$

$$55. (2x+3)^2 = 169$$
$$x = 5, -8$$

$$56. 3(2x-5)^2 + 2 = 17$$
$$x = \frac{5 \pm \sqrt{5}}{2}$$

Solve the quadratic equation by completing the square. Simplify radicals without decimals.

$$57. x^2 + 6x = 7$$
$$x = 1, -7$$

$$58. x^2 + 5x - 9 = 0$$
$$x = -\frac{5}{2} \pm \frac{\sqrt{61}}{2}$$

$$59. 2x^2 - 7x + 9 = (x-3)(x+1) + 3x$$
$$x = 6, 2$$

$$60. 3x^2 + 20x + 36 = 4$$
$$x = \frac{-10}{3} \pm \frac{2i}{3}$$

$$61. 4v^2 + 16v = 65$$
$$v = -2 \pm 9/2$$

$$62. ax^2 + bx + c = 0$$
$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Solve the quadratic equation using the quadratic formula. Simplify radicals without decimals.

$$63. x^2 + 8x - 2 = 0$$
$$x = -4 \pm 3\sqrt{2}$$

$$64. 2x^2 - 3x + 1 = 0$$
$$x = 1, 1/2$$

$$65. 3x + 4 = x^2$$
$$x = 4, -1$$

Solve the square root equation.

$$66. \sqrt{x+2} = 3$$
$$x = 7$$

$$67. \sqrt{3x-11} = \sqrt{5-x}$$
$$x = 4$$

$$68. x = 5 + \sqrt{3x-11}$$
$$x = 9, 4$$

$$69. \sqrt{2x-1} - \sqrt{x-5} = 3$$
$$x = 5, 41$$

$$70. x+1 - 2\sqrt{x+4} = 0$$
$$x = 5, -3$$

Section IV: Common Algebra Mistakes

Each of the following contains a very common algebraic error. Correct each of the errors and explain the error that was made.

1. $2x - (3y + 4) = 2x - 3y + 4$

2. $5z + 3(x - 2) = 5z + 3x + 2$

3. $(5x)(6x) = 30x^2$

4. $x(yz) = (xy)(xz) \cdot yz$

5. $a\left(\frac{x}{y}\right) = \frac{ax}{y}$

6. $(4x)^2 = 4x^2$

7. $\left(\frac{x}{y}\right)^3 = \frac{x^3}{y^3}$

8. $\sqrt{25 - x^2} = 5 - x \quad \sqrt{(5-x)(5+x)}$

9. $\sqrt{x+9} = \sqrt{x} + 3$
 $\sqrt{x+9}$

10. $(a+b)^2 = a^2 + b^2 \quad a^2 + 2ab + b^2$

11. $3^2 = 9$

12. $x^2 + 3x - 5 - (4x - 5) = x^2 - x - 10$

13. $\sqrt{7x} = (7x)^{\frac{1}{2}}$

14. $3(2x-5)^2 = 36x^2 - 180x + 225$
 $3(4x^2 - 20x + 25)$ FOIL First.

15. $\sqrt{x+y} = \sqrt{x} + \sqrt{y}$
 $\sqrt{x+y}$

16. $x^{-\frac{3}{2}} = \frac{1}{\sqrt{x^3}} = \frac{1}{x^{3/2}} = \frac{1}{\sqrt{x^3}}$