Name _____ School Attended Last Year _____

Grade (%) Fall Semester _____ Grade (%) Spring Semester _____

The content in this packet will be assessed after your teacher has reviewed its contents and you have had an opportunity to ask questions. Understanding this material is foundational to your success in this math course and should be taken seriously. It is expected that you know how to do the algebra prior to the first day of class—if you don't know how to complete a question, look it up online or ask for help.

Exponents/Polynomials/Linear Inequalities

For #1 – 10, simplify each expression. Leave only positive exponents in your answer.

1. $(3x)^3$
2. $\frac{x^4y^7}{xy^3}$
3. $2(ab)^0$
4. $(4x^3y^5)^2$
5. $4y^{-1}$
6. $(8b)^{-1}$
7. $\frac{x^6}{x}$
8. $\left(\frac{2}{3}\right)^{-4}$
9. $\frac{x^3}{x^7}$
10. $\frac{x^4z^{-4}}{x^3z^{-1}}$

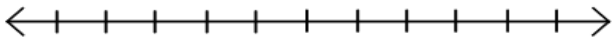
11. Given the expression $5x^2 - 9x + 10$:
    (a) State the degree.
    (b) State the leading coefficient.
    (c) State the type of polynomial.

For # 12 – 17, perform the indicated operation. Write your answer in descending degree.

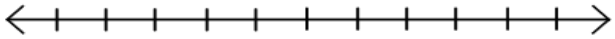
12. $(-8x^2 - 3x) + (-x^3 + 6x^2)$
13. $(5t^3 + 1) - (-4t^3 + 3t^2)$
14. $(x - 3)(2x + 7)$
15. $4x^2(x^3 - 5x^2 + 2)$
16. $(x - 5)^2$
17. $\frac{-22a^2+55a-11}{-11}$
18. Solve: $\frac{2}{3}x + \frac{3}{x}(x - 5) = x$

For 19 – 21, solve each inequality. Graph the solution set on a number line. Write your answer in both inequality and interval notation.

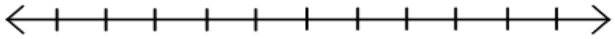
19. $-16 \leq -\frac{4}{5}x$



20. $3 < 3x + 4 < 10$

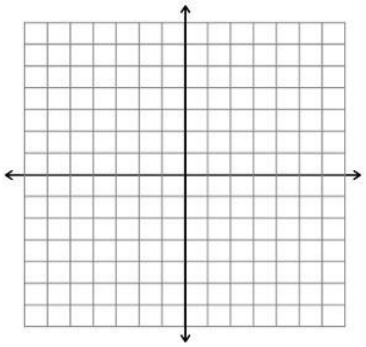


21. $4 - x \leq 4$ *or* $\frac{x}{2} + 3 < -2$



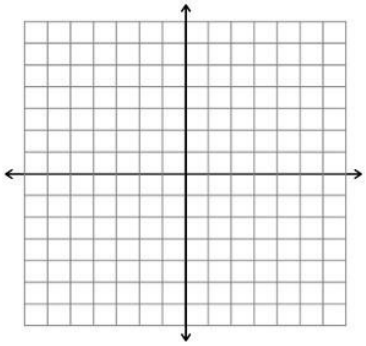
22. Sketch a graph of $3x + 4y = -8$.

a. State the x-intercept.
b. State the y-intercept.
c. State the slope.
d. State the domain.
e. State the range.



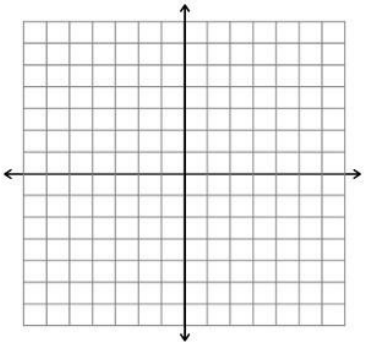
23. Sketch a graph of the solution set for $y < \frac{2}{3}x + 1$.

a. Graph one point that is a solution and label the point A.
b. Graph one point that is not a solution and label the point B.



24. Sketch a graph of $y = -1 \bullet (3)^x$.

a. State the x-intercept.
b. State the y-intercept.
c. State the domain.
d. State the range.



25. Due to an increased use of insecticides, the monarch butterfly population in the Midwest is decreasing. The population is one-tenth as large each year as compared to the prior year. The butterfly population was initially 100,000.
    a. Write an equation for this situation. Be sure to identify your variables.
    b. After 5 years, what will the butterfly population be? Interpret your answer in context.

26. The number of weeds in a yard are on the rise due to the recent rains. Initially there were 30 weeks in the yard, and each day 5 more weeds appeared in the yard.
    a. Write a model/equation for this situation. Be sure to identify your variables.
    b. How many days will it take to reach 100 weeks in the yard? Interpret your answer in context.

Factoring Quadratics

For # 27 – 41, completely factor each expression.

27. $12x^2 + 60x + 75$

28. $16x^3 - x$

29. $8x^6 - 32x^5 - 4x^4 + 16x^3$

30. $m^2n + 15mn + 56n$

31. $6a^4b^4 - 2a^3b + 8a^2$

32. $4c^2 - 4c + 1$

33. $4x^2 - 25$

34. $3p^2 - 21p - 24$

35. $x^2 - 6x + 9$

36. $x^2 - 3x$

37. $y^2 + 9y + 20$

38. $b^2 - 3b - 18$

39. $7a^2 - 42a - 112$

40. $2x^2 - 50$

41. $x^4 - 81$

Simplifying Square Root Expressions

For #42 – 49, simplify the square root by finding perfect square factors. Your answer should be exact and should not include decimal approximations.

42. $\sqrt{108}$

43. $\sqrt{180}$

44. $\sqrt{225}$

45. $\sqrt{128}$

46. $\sqrt{135}$

47. $2\sqrt{84}$

48. $\frac{2\sqrt{300}}{5}$

49. $\frac{\sqrt{99}}{99}$

For #50 – 53, rationalize the denominator. This means there should be no square roots in the denominator.

50. $\frac{\sqrt{5}}{\sqrt{3}}$

51. $\frac{2}{\sqrt{7}}$

52. $\frac{\sqrt{5}}{\sqrt{10}}$

53. $\frac{3\sqrt{6}}{\sqrt{2}}$

For #54 – 59, simplify the square root expression using the multiplication and division properties of radicals. Write your answer in simplest radical form (no decimals).

54. $\frac{\sqrt{3} \bullet \sqrt{6}}{\sqrt{2}}$

55. $9\sqrt{8} \bullet -5\sqrt{2}$

56. $\frac{\sqrt{50}}{15}$

57. $\frac{1}{3}\sqrt{63} \bullet \sqrt{2}$

58. $-4\sqrt{6} \bullet \sqrt{8}$

59. $\sqrt{\frac{6}{25}}$

For # 60 – 62, simplify the square root expression. Use fractions, not decimal approximations.

60. $\frac{-5 \pm 15\sqrt{2}}{15}$

61. $\frac{10 \pm \sqrt{20}}{2}$

62. $\frac{1 \pm \sqrt{8}}{5}$

Quadratic Functions.

In #63 – 70, solve each quadratic equation using one of the methods learned in class—by factoring, by completing the square, by the square root method, and/or by using the Quadratic Formula. Write your answer(s) in simplified radical form—no decimal approximations. To review, you may wish to solve some of these equations using multiple methods to ensure that you are completely familiar with each type.

63. $2x^2 - x - 1 = 0$

64. $2x^2 + x = -1$

65. $x^2 + 4x + 1 = 0$

66. $\frac{1}{2}x^2 - 16 = 20$

67. $2(x-1)^2 - 3 = 0$

68. $-2x^2 - 8x + 1 = 0$

Systems.

In #69 – 72, solve each system by substitution.

69. $x + 47 = -22$
$-2x - 2y = 14$

70. $x - 2y = 7$
$-3x + 6y = -1$

71. $-6x + y = -17$
$-7x - y = -22$

72. $4x + 7y = -14$
$x + 4y = -8$

In #73 - 76, solve each system by elimination.

73. $10x + 10y = -10$
$-9x + 2y = -24$

74. $4x - 8y = -4$
$-12x + 5y = -26$

75. $-5x - y = 2$
$4x + 3y = 5$

76. $x - 2y = -1$
$-5x + 8y = 11$