

Algebra II
Final Review

Name _____

Non-calculator problems are indicated.

1. (No calculator) Graph the function: $y = |x - 3| + 2$
2. (No calculator) Given the function $y = -2|x + 3| - 1$ and the value $x = -5$, find the corresponding y -value.
3. (No calculator) Simplify $(\sqrt{3} - 5)(\sqrt{3} - 5)$
4. (No calculator) Evaluate each function at the given value.
 - a. $f(x) = 2x - 1$; find $f(-2)$
 - b. $g(x) = 2 - x^2$; find $g(4)$
5. Find the x and y intercepts of the equation $2x + 5y = 10$
6. (No calculator) Simplify $(25x^4y^{-2})^{\frac{3}{2}}$
7. Graph the line $4x + 3y = 12$
8. Given the point $(6, 5)$ and $(1, y)$ and the slope $\frac{7}{5}$, find the value of y .
9. Given the point $(2, -3)$ and $(x, -7)$ and the slope $\frac{1}{2}$, find the value of x .
10. (No Calculator) Simplify $\frac{\sqrt[3]{54}}{\sqrt[3]{2}}$
11. (No Calculator) Solve: $(9 - 7x)^{\frac{1}{4}} = (9x - 7)^{\frac{1}{4}}$
12. (No Calculator) Subtract: $\sqrt[3]{16} - \sqrt[3]{54}$

13. Given the line $y = 4x - 3$, find
- The slope of a line perpendicular to $y = 4x - 3$
 - The slope of a line parallel to $y = 4x - 3$
14. Write the equation of the line that passes through $(3, -1)$ and is perpendicular to the line given by the equation $y = -\frac{1}{5}x - 4$.
15. Write the equation of:
- A horizontal line passing through the point $(-2, 3)$
 - A vertical line passing through the point $(4, -6)$
16. (No Calculator) Simplify: $\sqrt[4]{2x^9} \cdot \sqrt[4]{8x^6}$
17. (No calculator) For each quadratic function, find the y-intercept, the x-intercepts and the vertex.
- $f(x) = -2x^2$
 - $f(x) = x^2 - 4x + 4$
 - $f(x) = x^2 - 6x + 8$
18. (No calculator) Find the minimum or maximum of each function. State the domain and range of each function.
- $f(x) = -6x^2$
 - $f(x) = x^2 + 2x + 15$
 - $f(x) = -x^2 - 2x + 3$
19. Solve each equation.
- $x^2 - 4 = 60$
 - $2x^2 + 5x - 3 = 0$
20. (No calculator) Simplify
- $(3i)(-2i)(5i)$
 - $(10 - 4i) - (7 + 3i)$
 - $(7 - 6i)(2 - 3i)$

21. Find the value of the discriminant and determine the number of real solutions for each equation.

a. $x^2 - 8x + 16 = 0$

b. $x^2 - x + 1 = 0$

c. $x^2 + 8x + 13 = 0$

22. (No calculator) Graph each function.

a. $y = (x - 3)^2 - 1$

b. $y = -(x + 4)^2 + 2$

23. Describe the transformations to each function below from $g(x)$

a. $g(x + 2)$

b. $g(x) + 2$

c. $g(x - 2)$

d. $g(x) - 2$

e. $-g(x)$

24. (No calculator) Graph the solutions to the polynomial inequality on a number line and/or xy-axis

a. $x^2 - 3x - 10 < 0$

b. $x^4 + 7x^3 + 6x^2 \geq 0$

c. $-x^2 - 64 \leq -16x$

25. Simplify

a. $\frac{-6a^4b^{-8}}{36a^7b^{-2}c^{-1}}$

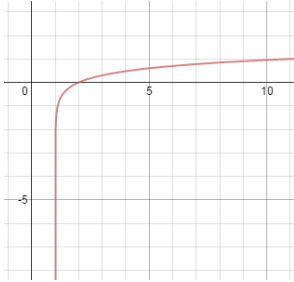
b. $\left(\frac{x^4y^{-2}}{5x^3y^2} \cdot \frac{10x^2}{3y^{-8}}\right)^2$

26. (No Calculator) Simplify: $12^{\frac{1}{2}} \cdot 3^{\frac{1}{2}}$

27. (No Calculator) Solve: $25^{2x+1} = 125^{3x}$

28. Johnny has \$1500 that he deposits into an account that pays 3.9% interest compounded quarterly. How long before his balance is \$2000?

29. The graph below is an example of which of the following?



- a. exponential growth
- b. exponential decay
- c. logarithmic
- d. square root
- e. none of the above

30. A shoe company found that the annual sales of their company, in millions, could be modeled by the equation $A = -0.3t^3 + 5t^2 - 15t + 101$ from the years 1995 to 2007, where $t = 0$ in 1995. How much money did the company make in sales in 2001?

31. Given $f(x) = x^2 - 3$ and $g(x) = 3x + 1$, find

- a. $f(x) + g(x)$
- b. $g(x) - f(x)$
- c. $f(g(x))$
- d. $g(f(x))$
- e. $f(-2)$
- f. $f^{-1}(x)$

32. Find the inverse of each function.

- a. $y = x + 2$
- b. $y = 8x - 10$

33. Rewrite the expression in radical form.

- a. $5^{\frac{1}{3}}$
- b. $12^{\frac{2}{7}}$

34. Solve each equation.

a. $\sqrt{3x+1} = 5$

b. $2 + \sqrt{3x+7} = 6$

35. Multiply and/or divide.

a. $\frac{5x^2}{x^2-4} \cdot \frac{x+2}{10x^5}$

b. $\frac{x^2-5x-24}{x+1} \cdot \frac{x^2-6x-7}{x+3}$

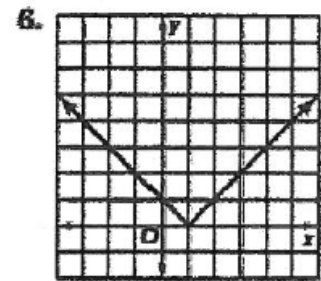
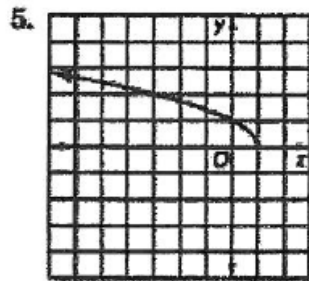
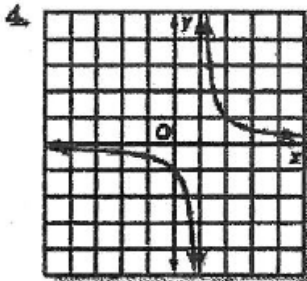
c. $\frac{x^2+19x+84}{4x-4} \div \frac{x^2+9x+14}{2x-2}$

36. (No Calculator) Match each graph with its equation.

A. $y = |x - 1|$

B. $y = \frac{1}{x-1}$

C. $y = \sqrt{1-x}$



37. Solve: $\frac{x-2}{x+4} = \frac{x+1}{x+10}$

38. Solve: $\frac{2}{x^2-x} = \frac{1}{x-1}$

39. A classic car that was bought for \$52,000 increases in value 2.5% each year. Write an exponential model that describes its value after t years.

40. A new computer bought for \$1,500 decreases in value by 1% each year. How much will the computer be worth in 10 years?

41. If \$7,500 is deposited into a bank account that pays 6.5% compounded continuously, write an equation that represents how much money you will have after t years. Then calculate how much money will you have after 1

42. Write each equation in exponential form.

- a. $\log_3 243 = 5$
- b. $\log_5 \frac{1}{25} = -2$
- c. $\log 15 = x$
- d. $\ln x = 0.6931$

43. Write an equivalent expression for $\log_2 9$ using the change of base formula.

44. (No Calculator) Evaluate each expression.

- a. $\log_5 25$
- b. $\log_9 3$
- c. $\log_5 \frac{1}{125}$
- d. $\log_8 8^3$
- e. $e^{\ln 3}$
- f. $\ln e^{-2.5}$

45. (No Calculator) Solve each equation.

- a. $\log_3 x = 5$
- b. $\log_{\frac{1}{4}} x = 3$
- c. $\log_x 3 = \frac{1}{2}$
- d. $\log_5(3x) = 2$

46. Simplify each expression.

- a. $3e + 5e - (2e + 1)(3e - 1)$
- b. $e\left(\frac{e^2}{5}\right)^2$
- c. $4e^{2x} \cdot \frac{1}{2}e^{-8x}$

47. Graph the equations $y = 2^x$ and $y = \log_2 x$. What do you notice about the graphs compared to one another?

48. Solve each equation

- a. $5^{3x} = 106$
- b. $2^{x+1} = 17$
- c. $2e^x - 1 = 11$
- d. $\ln(3x) = 2$
- e. $8\ln(x + 3) = 16$

49. Write the explicit formula for the arithmetic sequence, then find the 10th term:
101, 202, 303, ...
50. Find the first five terms of the arithmetic sequence with $a_1 = 6$ and $d = 9$
51. Write the formula for the arithmetic sequence where the first term is 18 and the common difference is 2. Then find the 8th term in the sequence.
52. Use summation notation to write the series $5 + 8 + 11 + 14 + \dots$ for the first 40 terms.
53. Find the sum of the first 40 terms for the series $5 + 8 + 11 + 14 + \dots$
54. What are the first 5 terms of the series given by: $\sum_{n=1}^{50} n^2 - 2$
55. Find the sum of the arithmetic series given by: $\sum_{n=1}^{18} 10 + 3n$
56. Find the first five terms of the geometric series where the first term is 6 and the common ratio is 2.
57. Write an equation for the n th term of the sequence: 2, -6, 18.
58. Find the sum of the geometric series: $\sum_{n=1}^9 2(-3)^{n-1}$
59. As a group, the Dutch are among the tallest people in the world. The average Dutch man is 184 cm tall – just over 6 feet! The standard deviation of men's heights is about 8 cm. Assuming the distribution is approximately Normal, sketch a model and clearly label 1, 2, and 3 standard deviations above and below the mean.

60. Let's say it takes you 20 minutes, on average, to drive to school, with a standard deviation of 2 minutes. Suppose a Normal model is appropriate for the distribution of driving times.

- About how often will it take you between 18 and 22 minutes to get to school?
- How often will you arrive at school in less than 22 minutes?
- How often will it take you more than 24 minutes?

61. For an agility test, fourth-grade children jump from side to side across a set of parallel lines, counting the number of lines they clear in 30 seconds. Here are their scores

22 17 18 29 22 22 23 24 23 17 21 25
 20 12 19 28 24 22 21 25 26 25 16 27
 22

- Find the mean, median and mode.
- Find the standard deviation.
- Find the five number summary.
- Find the range and IQR.
- Are there any outliers? How do you know?
- Sketch a boxplot.
- Which number is the 80th percentile?

62. Two psychologists surveyed 478 children in grades 4, 5, and 6 in elementary schools in Michigan. They asked the students whether their main goal was to get good grades, to be popular, or to be good in sports. Below is a 2 way table with the results.

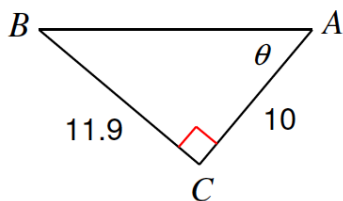
Goals

	Grades	Popular	Sports	Total
Boy	117	50	60	227
Girls	130	91	30	251
Total	247	141	90	478

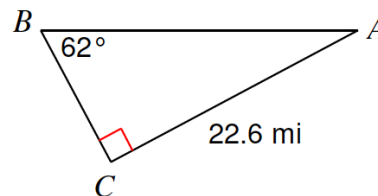
- What is the probability that a randomly selected student's goal is to excel in sports?
- What is the probability that a randomly selected student is a Boy?
- What is the probability that a randomly selected student's goal is to be popular given they are a girl?
- What is the probability that a randomly selected student is a boy, given that their goal is get good grades?

63. Solve the following right triangles.

a.



b.



64. State the amplitude, period, maximum value and minimum value of the following.

a. $y = 3\cos 3x - 1$

b. $y = -2\sin \pi x + 2$

c. $y = \sin \frac{1}{2}x$

65. (No Calculator) Evaluate the following.

a. $\sin 30^\circ$

b. $\cos 135^\circ$

c. $\tan \frac{4\pi}{3}$

d. $\sin 270^\circ$

e. $\cos 90^\circ$

f. $\tan \frac{\pi}{2}$

66. If $\tan \theta = \frac{7}{24}$ and θ is in quadrant III, find $\cos \theta$ and $\sin \theta$.