

Algebra 2/Trig
Second Semester
Final Review

Name _____

Please do all work on a separate sheet of paper.

1. Find the solution of $\left(\frac{1}{4}\right)^x = 4^{x-8}$
2. Find the solution of $\left(\frac{1}{3}\right)^x = 3^{x-6}$
3. Evaluate $3^{\log_3 9}$
4. Evaluate $9^{\log_9 4}$
5. Solve $\log_{10}(x^2 + 36) = \log_{10} 100$
6. Solve $\log_9(x^2 + 9x) = \log_9 10$
Given $\log_9 7 = 0.8856$ and $\log_9 4 = 0.6309$ find the value of
7. $\log_9 28$
8. $\log_9 49$
9. Solve $\log_8(n-3) + \log_8(n+4) = 1$
10. Solve $\log_{10} a + \log_{10}(a+21) = 2$
11. Find the approximate solution of $5^{x-1} = 3^x$
12. Find the approximate solution of $8^{x-2} = 5^x$
13. Find the approximate value of $\log_3 5$
14. Find the approximate value of $\log_3 25$
15. Solve $\log_9 x = \frac{1}{2} \log_9 144 - \frac{1}{3} \log_9 8$
16. Solve $\frac{1}{2} \log_4 x = \frac{1}{3} \log_4 64$
17. A certain strain of bacteria can grow from 30 to 195 in 5 hours. What is the approximate value of k for the growth formula $y = ne^{kt}$
18. Assume \$500 is deposited into a savings account. If the interest rate is 8.25% compounded continuously, after how many years will the amount of money in the account be tripled? Use $A = Pe^{rt}$ and round your answer to the nearest 10th
19. In which quadrant is the terminal side of $\theta = -\frac{5\pi}{4}$?
20. Find one positive and one negative angle that is coterminal with $\theta = \frac{5\pi}{6}$.
21. If $\tan \theta = \frac{3}{4}$ and $\sin \theta < 0$, find $\cos \theta$.
22. Simplify $\frac{1}{1 + \cos \theta} - \frac{1}{1 - \cos \theta}$.

23. The tailgate of a truck is 2 feet above the ground. The incline of a ramp used to load the truck is 16° . Find the length of the ramp.

24. Find the exact value of $\sec(-210^\circ)$.

25. Find the amplitude and the period of the function $y = -\frac{2}{5} \sin 5\left(x + \frac{\pi}{4}\right) + 3$.

26. Graph $y = \frac{3}{2} \sin \pi x + 2$.

27. Graph $y = -\tan 2x$.

28. For what range of values of θ is the function $\text{Arc cos } \theta$ defined?

29. Find the exact value of $\cot \left[\text{Arc tan } \frac{9}{40} \right]$.

30. Find the exact value of $\sec \left[\text{Sin}^{-1} \frac{1}{3} \right]$.

31. Find the exact value of $\sec \left[\text{Arc tan } \frac{x}{4} \right]$.

32. A hiker travels at 3.6 mi/hr at a heading of $N26^\circ W$ from a ranger station. After 6.5 hours, how far north and how far west is the hiker from the ranger station?

33. A private seaplane travels in a straight line from a local airstrip to a remote lake that is 211 miles east and 320 miles north of the airstrip. Find the lake's bearing and distance from the airstrip.

34. Simplify $\frac{\sec^2 x - 1}{\sin^2 x}$

Verify the identity

35. $\tan^2 x + 4 = \sec^2 x + 3$

36. $\cos^2 x - \sin^2 x = 1 - 2 \sin^2 x$

Solve each of the following for all $0 \leq x < 2\pi$

37. $\sqrt{3} \csc x - 2 = 0$

38. $3 \cot^2 x - 1 = 0$

39. $\sin x (\cos x + 1) = 0$

Find the exact value for each of the following.

40. $\sin(15^\circ)$

41. $\tan\left(\frac{5\pi}{12}\right)$

42. $\cos 15^\circ \cos 30^\circ - \sin 15^\circ \sin 30^\circ$

Given $\sin u = -\frac{7}{25}$, and $\cos v = -\frac{4}{5}$, where both u and v are in Quadrant III, find

43. $\sin(u + v)$

44. $\tan(u - v)$

Given $\sin u = -\frac{4}{5}$ and $\pi < u < \frac{3\pi}{2}$, find

45. $\cos(2u)$

46. $\sin(2u)$

47. Given $\cos x = -\frac{5}{13}$ and $\frac{\pi}{2} < x < \pi$

Find the **five** remaining trigonometric values.

Solve each of the following.

48.
$$\begin{cases} x - y = -4 \\ x^2 - y = -2 \end{cases}$$

49.
$$\begin{cases} x - y = 0 \\ 5x - 3y = 10 \end{cases}$$

50.
$$\begin{cases} 1.5x + .8y = 2.3 \\ 0.3x - 0.2y = 0.1 \end{cases}$$

51.
$$\begin{cases} \frac{2}{3}x + \frac{1}{6}y = \frac{2}{3} \\ 4x + y = 4 \end{cases}$$

52.
$$\begin{cases} x - 2y + 3z = 9 \\ -x + 3y = -4 \\ 2x - 5y + 5z = 17 \end{cases}$$

53.
$$\begin{cases} 2x + 4y - z = 7 \\ 2x - 4y + 2z = -6 \\ x + 4y + z = 0 \end{cases}$$

54.
$$\begin{cases} x - 3y + z = 1 \\ 2x - y - 2z = 2 \\ x + 2y - 3z = -1 \end{cases}$$

55. Find the equation of a parabola that travels through $(0,3), (1,6), (-1,2)$

Graph each of the following on graph paper.

56. $(x-1)^2 + (y-2)^2 \leq 25$

57.
$$\begin{cases} x + y \leq 1 \\ -x + y \leq 1 \end{cases}$$

58.
$$\begin{cases} y \geq 0 \\ x \geq 0 \\ y \leq -x + 4 \end{cases}$$

Graph

$$59. \begin{cases} x^2 + y^2 \leq 9 \\ (x-2)^2 + y^2 \leq 9 \end{cases}$$

Linear programming

$$60. \text{ Graph } \begin{cases} x \geq 0 \\ y \geq 0 \\ x + 3y \leq 15 \\ 4x + y \leq 16 \end{cases} \text{ use the objective function: } z = 3x + 2y \text{ to find the maximum.}$$

61. Which term of the arithmetic sequence $-4, 2, 8, \dots$ is 170?

62. What is S_n for the arithmetic series in which $a_1 = 91$, $d = -4$, and $a_n = 15$?

63. What is S_n for the arithmetic series in which $a_1 = -2$, $d = \frac{1}{3}$, and $a_n = 9$?

64. What is the 5th term of the geometric sequence in which $a_1 = 2$ and $r = 3$?

65. What is the 5th term of the geometric sequence in which $a_1 = 576$ and $r = \frac{1}{2}$?

66. Find the sum of the infinite geometric series $1 + \frac{2}{3} + \frac{4}{9} + \dots$

67. Find the sum of the infinite geometric series $15 + 10 + \frac{20}{3} + \dots$

68. Evaluate $\sum_{n=1}^6 (2n + 11)$

69. Evaluate $\sum_{k=7}^{11} (42 - 9k)$

70. Find the 4th term of $(2a + b)^5$

71. Find the 5th term of $(y - 5)^6$

72. The letters a, c, e, g, b, and k are used to form 6-letter passwords. How many passwords can be formed if the letters can be used more than once in any given password?

73. The biology class is preparing for its final exam. From a class of 22 girls and 16 boys, how many study groups of 2 girls and 3 boys can be formed?

74. In her pocket Linda has 5 nickels, 3 dimes and 7 pennies. She selects 3 coins. What is the probability that she has selected 3 nickels or 3 pennies?