

Fox Lane High School



Mathematics Department

Precalculus Honors Summer Assignment 2026

Hello future Precalculus Honors Students!

Attached is the summer assignment for students taking Precalculus Honors next year. This summer assignment is intended to highlight and review the prerequisite skills and topics for which you should have conceptual understanding to be successful in Precalculus Honors.

It is expected that you understand how to complete every problem in this set by the beginning of the school year. However, in September I will dedicate two or three class periods to answering questions. You will then be assessed on this material approximately one week into the school year.

You should complete as much of this assignment as possible **without the use of a calculator**. You will not be allowed (nor should you need) a calculator for most of the work we do in this class (with a few minor exceptions).

Our Google Classroom for next year has already been created. Feel free to join that classroom using the following code: **u2pk2wpt**. The solutions for the summer assignment are posted on the Google Classroom.

I hope you enjoy your summer! Afterall, who wouldn't enjoy completing 127 math problems during summer break? 😊

I'm looking forward to starting our work together in September!

Please feel free to reach out to me with any questions or concerns at **mkimmerle4532@bcsdny.org**.

Mr. Kimmerle

**Precalculus Honors
Summer Packet**

Factorization**A. Factor each of the following expressions completely.**

1. $x^2 + 3x + 2$

2. $5x^2 + 16x + 3$

3. $xy + 2x^2 + 3y + 6x$

4. $2x^3 + 8x^2 - 9x - 36$

5. $x^4 - 81y^4$

6. $x^3 - 8y^3$

7. $x^6 - y^6$

8. $27x^3 + 64$

B. Solve each of the following equations.

9. $2x^2 + 8x + 6 = 0$

10. $x^4 - x^2 = 0$

11. $x^3 - 8 = 0$

12. $7x^2 + 8x - 1 = 0$

13. $6x^2 + 31x + 18 = 0$

14. $4x^2 + 12x + 9 = 0$

15. $x^4 - 16 = 0$

16. $54 + 9x^2 + 27x = 27$

Radicals

A. Express the following radicals using fractional exponents in simplest form.

17. $\sqrt{x+3}$

18. $\sqrt{a+2b^2}$

19. $\sqrt[3]{8x^2}$

20. $\sqrt[12]{2^8 x^8}$

B. Express the following using only radicals (no fractional exponents).

21. $x^{2/5} y^{9/5}$

22. $(x+y)^{1/2}$

23. $(\sin x)^{1/2}$

24. $7^{1/3} x^{7/6}$

C. Simplify each of the following radicals.

25. $\sqrt{x^2 + 4x + 4}$

26. $\sqrt{x^2(x-4)^2}$

27. $\sqrt[4]{x^7 y^6 x^{-1} y^{-2}}$

28. $\sqrt[3]{x^2 y^3}$

D. Solve each of the following radical equations.

29. $\sqrt{x+1} + 2 = 3$

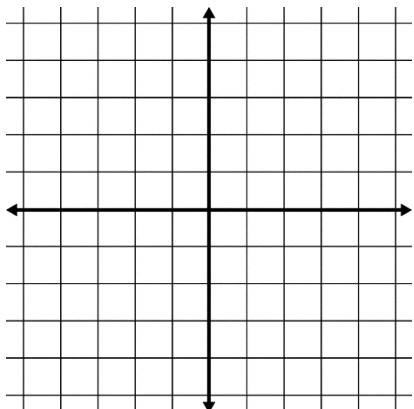
30. $\sqrt{-2x + x^2} = \sqrt{3}$

31. $\sqrt[3]{2x-1} = x^{2/3}$

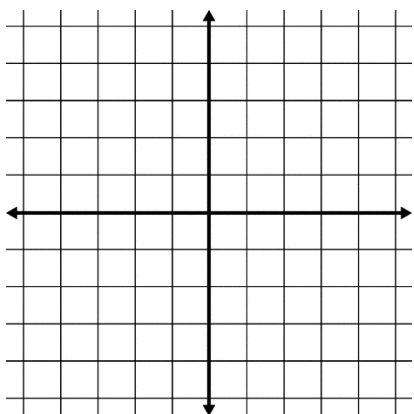
Quadratic Equations and Parabolas

A. Sketch the graph of each of the following quadratic functions.

32. $y = x^2 + 3x + 2$



33. $x = \frac{(y-4)^2}{8} + 3$



B. Find the vertex of each of the following quadratic functions.

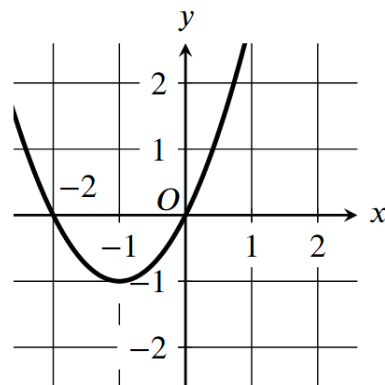
34. $y = 3(x-4)^2 + 2$

35. $y = x^2 - 2x - 8$

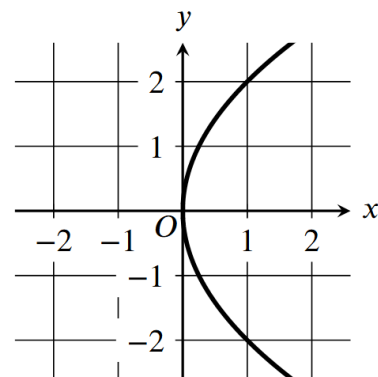
36. $y = x^2 + 4x + 4$

C. State the equation and the vertex of each of the following parabolas. Write all equations in standard quadratic form.

37.



38.



Systems of Equations

Solve each of the following systems of equations.

39.

$$\begin{aligned}x + 3y &= 3 \\ 4x - y &= 25\end{aligned}$$

41.

$$\begin{aligned}x + 6y &= 3 \\ 2x + 2y &= -4\end{aligned}$$

40.

$$\begin{aligned}x - y - z &= -3 \\ 2x + 3y + 4z &= 21 \\ 4x + y - z &= 18\end{aligned}$$

42.

$$\begin{aligned}x - y - z &= 4 \\ 4x + y - z &= 30 \\ 5x + 3y - 2z &= 40\end{aligned}$$

Rational Expressions and Equations

A. Simplify each of the following rational expressions.

43. $\frac{x^2 - 6x + 9}{x^2 + 6x + 9} + \frac{x - 3}{x + 3}$

44. $\frac{4}{3x + 1} - \frac{x}{x - 3}$

45. $\frac{4x}{x + 3} \cdot \frac{x^2 + 6x + 9}{2x}$

46. $\frac{x + 3}{x} \div \frac{x + 3}{x^2 - 3x}$

B. Solve each of the following rational equations.

47. $\frac{4}{x^2 + 3x + 2} + \frac{x}{x + 1} = \frac{3}{(x + 2)(x + 1)}$

48. $\frac{3}{x + 1} - \frac{4}{x + 3} = 0$

49. $\frac{x - 5}{x + 5} \cdot \frac{2x - 10}{3x - 15} = 1$

50. $\frac{x}{x - 1} \div \frac{x}{x + 3} = 0$

Polynomial Functions

A. State the end behavior of each of the following polynomial functions. Justify your answers.

51. $y = x^3 + x^2 + x + 1$

52. $y = -4x^2 + 3x - 9$

53. $y = x^5 + x^6 + 2x^3 - 4x^7 + 10x$

B. Simplify each of the following expressions using division.

54. $\frac{x^3 + 4x^2 + x}{x + 1}$

55. $\frac{x^4 + x^3 + x^2 + x + 1}{x}$

C. Expand each of the following.

56. $(x + 3)^2$

57. $(2x - 3)^3$

58. $(x + 1)^4$

59. $(3x + 2)^2$

Exponential and Logarithmic Expressions and Equations

A. Simplify each of the following exponential expressions.

60. $x^2 x^3 x^4$

61. $\frac{2^{19}}{2^{13}}$

62. $\frac{x^7}{x^5}$

63. $\frac{x^5 y^6 z^{-1}}{x^{-2} y^4 z^{-4}}$

B. Simplify each of the following logarithmic expressions.

64. $\log 100$

65. $\log_2 64$

66. $\log x + \log y - 2 \log z$

C. Solve each of the following exponential equations.

67. $2^x = 128$

68. $3^{7-x} = 27^x$

69. $9^{x+1} = 27^{x/2}$

D. Solve each of the following logarithmic equations.

70. $\log x = 3$

71. $\log_4(x+6) = 2 \log_4 x$

72. $\ln(5x) = 4$

73. $\ln x = \ln(6x+1)$

74. $\log_3 x - \log_3(5x+1) = \log_3(3x)$

Circular Functions

A. Evaluate each of the following.

75. $\sin\left(\frac{3\pi}{4}\right)$

76. $\cot\left(\frac{5\pi}{6}\right)$

77. $\cos \pi$

78. $\csc\left(\frac{7\pi}{6}\right)$

79. $\tan\left(\frac{\pi}{2}\right)$

B. Find the values of the six trigonometric functions given each of the following initial conditions.

80. $\tan \theta = \frac{7}{6}, \pi < \theta < \frac{3\pi}{2}$

81. $\sec \theta = 4\sqrt{3}, 0 < \theta < \frac{\pi}{2}$

C. Solve each of the following trigonometric equations for $0 \leq x < 2\pi$.

82. $6 + \sin x = 5$

83. $\cos^2 x + 3 \cos x + 2 = 0$

84. $\csc^2 x + 2 \cot x + 4 = 4$

85. $\sin x + \sin^2 x = 0$

Inverse Functions

Find the inverse of each of the following functions. Use standard inverse notation to express your answers.

86. $y = 8x$

90. $y = \sin^2 x$

87. $y = \sqrt{x+6}$

91. $f(x) = \log_8(x+3)$

88. $f(x) = \sqrt{9x^3}$

92. $h(x) = 7^{x+3}7^x$

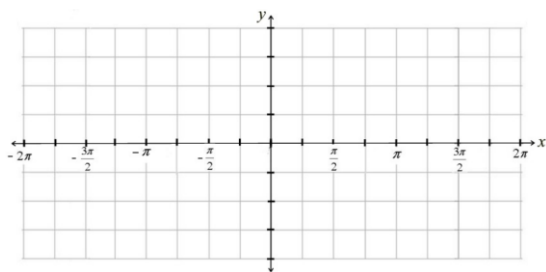
89. $f(x) = \frac{x}{x+5}$

93. $y = \frac{5\cos\pi}{x+3}$

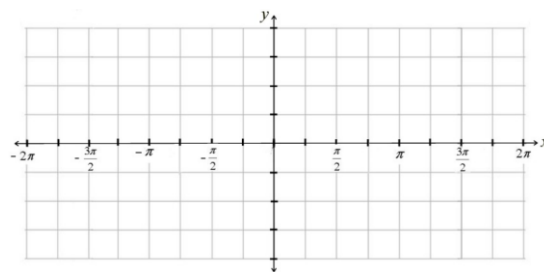
Graphs of Trigonometric Functions

Sketch the graph of each of the following trigonometric functions. For each function, state the amplitude, phase shift, vertical shift, period, and frequency.

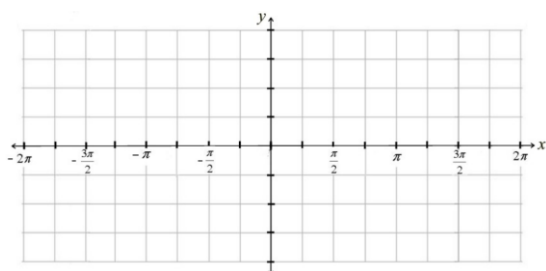
94. $y = \sin(2x)$



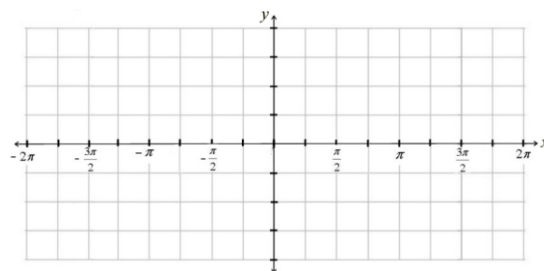
97. $g(x) = 3\cos(2x)$



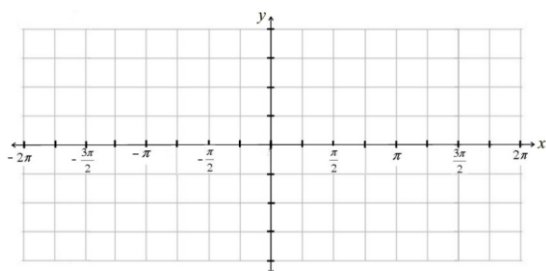
95. $f(x) = 1 - 2\cos x$



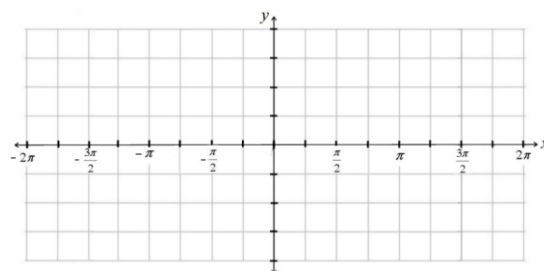
98. $y = \frac{1}{2}\sin(x - \pi)$



96. $y = 2\sin\left(\frac{x}{2} + \frac{\pi}{4}\right) - 1$



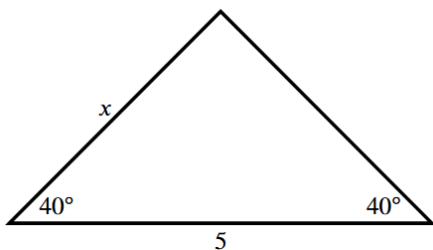
99. $f(x) = 2\cos\left(\frac{1}{2}x - \frac{3\pi}{4}\right) + 1$



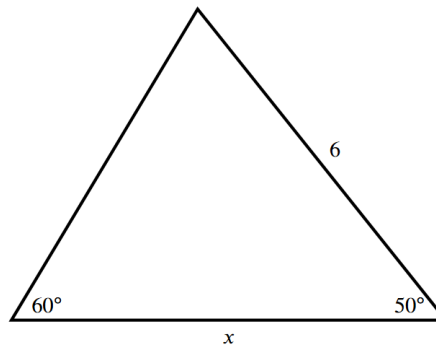
Applications of Trigonometry – Part I

In each of the following triangles, solve for x and y (if applicable). (A calculator is allowed for this section.)

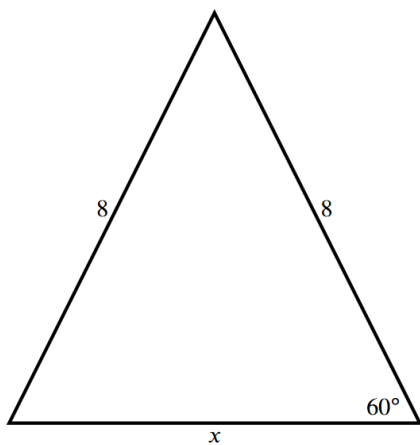
100.



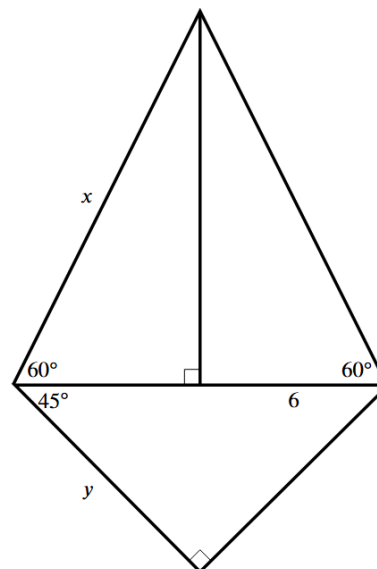
102.



101.



103.



Applications of Trigonometry – Part II

Simplify each of the following trigonometric expressions.

104. $\frac{\sin x}{3 \cos x}$

105. $\frac{\tan x}{\sec x}$

106. $3 \cot x \sec x$

107. $\frac{\sec x}{\csc x}$

108. $\cot^2 x - \csc^2 x$

109. $\cot^2 x \csc^2 x \sec^2 x$

110. $\sin^2 x \cot^2 x + \cos^2 x \tan^2 x$

111. $\frac{\csc^2 x}{\cot^2 x} - \tan^2 x$

Geometry

A. State the equation that gives the area of each of the following figures.

112. Square

113. Rectangle

114. Triangle

115. Circle

116. Parallelogram

B. State the equation that gives the volume of each of the following figures.

117. Rectangular prism

118. Cube

119. Cylinder

C. State the equation that gives the surface area of each of the following figures.

120. Cube

121. Rectangular prism

122. Cylinder

D. Find the area of each two-dimensional figure; find the volume of each three-dimensional figure.

123. A square with side length 8

124. A rectangle with length 8 and width that is twice the length

125. A cylinder with base radius 5 and height 10

126. A parallelogram with length 5, height 2, and diagonal length 3

127. Find the surface area of a cylinder with base radius 5 and height 2