Name _____ AP/Honors Calculus Summer Assignment

OVERVIEW:

The following assignment contains concepts that are previously covered in prior math courses that are relevant to your up-coming Calculus school year! Please work out all solutions on a separate piece of scratch paper (yes you can use more than one piece.). Show all work that lead to your answer and box in the solution to each problem, when appropriate or relevant. Practice keeping your scratch work clean, and organized- unorganized and messy work will not be tolerated in class and will be marked and graded accordingly.

This assignment will NOT be collected nor graded, but is a good indicator for what to expect for the coming school year of what you need to be coming into the course with, as we will have little time to dwell on concepts developed in previous courses. The assignment should be used as a tool to recall past concepts and to stay fresh with the accurate steps to a successful year in Calculus!

There WILL be an assessment within the first 2 weeks of returning to school on the concepts you will find throughout this assignment with limited classroom time devoted to re-teaching these concepts.

If you are in need of a review of certain topics, please consult the websites dedicated to the Khan Academy and Regents Prep or watch some videos from the Organic Chemistry Tutor on YouTube. Beware of blind or surface level google searches or any answers obtained using AI tools like ChatGPT- Chat has proven to be not very good at higher maths and sciences (it'll give you wrong answers and be adamant that those answers are correct, even after you tell it that it's wrong).

Regents Prep

http://www.regentsprep.org/Regents/math/algtrig/math-algtrig.htm

Khan Academy

http://www.khanacademy.org/math/trigonometry

The Organic Chemistry Tutor (navigate around- lots of playlists)

https://www.youtube.com/playlist?list=PL0o_zxa4K1BWYThyV4T2Allw6zY0jEumv

Bonus Challenge: Here are some sample AP Precalculus Questions. Anyone ready for AP Calculus should have no problem with any of these questions:

https://apcentral.collegeboard.org/media/pdf/ap-precalculus-practice-exam-multiple-choice-section.pdf

Solve each equation. Remember to check for extraneous solutions.

1. $x^2 - 6x = 16$

2. $81x^2 - 169 = 0$

3. $5n^2 - 10n + 7 = 3n$

4. $\frac{12}{t} + t - 8 = 0$

5. $\frac{9}{b+5} = \frac{3}{b-3}$

6. $\frac{t+4}{t} + \frac{3}{t-4} = \frac{-16}{t^2 - 4t}$

Simplify each function as much as possible. State any restrictions on the domain.

7. $f(x) = \frac{6x^5 - 9x^3 + 12x^2}{15x^4 - 3x^3}$

8. $f(x) = \frac{3x^2 + 5x - 2}{x^3 - 4x}$

9. $f(x) = \frac{x^2 + 10x + 9}{x^2 - 81}$

Expand each expression by writing as a polynomial in standard form.

10. $(x+4)^3$

11. $(x-2)^4$

Factor each expression completely.

12. $2x^2 - 20x + 48$

13. $2x^2 - x - 36$

14. $12x^2 + 32x + 5$

15. $x^4 + 3x^3 - 25x^2 - 75x$

16. $3x^3 - 8x^2 + 21x - 56$

17. $3x^5y(x-1) + 2x^2y^2(x-1)$

18. $3x^4 + 25x^2 - 18$

19. $7x^4 - 140x^2 + 700$

20. $x^4 - 1$

21. $\sin^2 x + 3\sin x + 2$

22. $3\tan^2 x - 4\tan x + 1$

23. $2\cos^2 x \csc x - \csc x$

Evaluate each expression based on the unit circle. All answers should be exact. (Some expressions will be undefined.)

24. $\tan 2\pi$ 25. $\cos \frac{\pi}{6}$ 26. $\sin \frac{5\pi}{4}$ 27. $\tan \frac{4\pi}{3}$ 28. $\cos 0$

29. $\sec \frac{5\pi}{3}$ 30. $\csc \pi$ 31. $\cot \frac{7\pi}{4}$ 32. $\csc \frac{11\pi}{6}$ 33. $\sin \frac{3\pi}{2}$

34. $\sin \frac{13\pi}{3}$ 35. $\cos \frac{7\pi}{2}$ 36. $\tan \frac{15\pi}{4}$ 37. $\cos \frac{23\pi}{6}$ 38. $\csc 15\pi$

39. $\cos\left(-\frac{11\pi}{4}\right)$ 40. $\tan\left(-\frac{19\pi}{3}\right)$ 41. $\sin\left(-\frac{9\pi}{2}\right)$ 42. $\tan\left(-\frac{21\pi}{6}\right)$ 43. $\sec\left(-\frac{7\pi}{6}\right)$

Simplify each expression using trigonometric identities (Pythagorean, reciprocal, quotient, and double-angle identities).

44. $\frac{\sec x}{\tan x}$ 45. $\frac{\cot \theta}{\cos \theta}$ 46. $\frac{\sin (x + 2\pi)}{\cos x}$

47. $(1 + \cos \theta)(\csc \theta - \cot \theta)$ 48. $\sin \beta \cos \beta \sec \beta \cot \beta$ 49. $(1 - \alpha)\sec \alpha$

50. $\tan x \cos^2 x - \tan x$ 51. $\cos^2 x (\sec^2 x - 1) + \sin^2 x (\cot^2 x - 1)$

52. $\frac{\sin 2x}{\sin x}$ 53. $2\sin \theta \cos \theta + 5\sin 2\theta$

Use properties of exponents and logarithms to simplify each expression.

54. $ln\ 1$ 55. $ln\ e^{3x-8}$ 56. $ln\ 5x\ - ln\ 3x$ 57. $\frac{1}{4} ln\ 16x^4$

58. $81^{1/2}$ 59. $((3x^2y^{-4}z)^{-3})^0$ 60. $\frac{12a^4b^{1/3}}{3a^{-2}b^{2/5}}$ 61. $\left(64^{\frac{1}{3}}\right)^{\frac{1}{2}}$

62. $((x^2+y^2)^3)^{1/6}$ 63. $ln\ \frac{x}{5} + 2\ ln\ ln\ 5x$ 64. $\sqrt{27x^3y^4} + y^2x\sqrt{75x}$ 65. $ln\ 2x\ - ln\ x$

Use a graphing calculator to answer the following questions.

66. $f(x) = 3x^5 - 19x^3 + 12x^2 - 7$

a. Find the x-intercepts of the function.

b. Find all maxima and minima of the function.

c. For what value(s) of x does f(x) = 7000?

67. $f(x) = 5x^3 - 194x^2 - 244x + 160$

a. Find the x-intercepts of the function.

b. Find all maxima and minima of the function.

c. For what value(s) of x does f(x) = 3?

68. Find all values of x for which $ln\ (7x-3)\ + 2 = \sqrt{x^2+9}$

69. Find all values of x for which $\sqrt[3]{x} = cos\ x$

Write the equation of each line using point-slope formula.

70. $m = \frac{2}{3}$, $through\ (7,-2)$ 71. $through\ (-2,3)\ and\ (1,9)$ 72. $m = -\frac{5}{4}$, $f(3) = -1$

Set up and simplify the difference quotient for each function.

$$difference\ quotient\ of\ f(x) = \frac{f(x+h) - f(x)}{h}$$

73. $f(x) = 3x - 5$ 74. $f(x) = x^2 + 4$ 75. $f(x) = 3x^2 - 8x$

76. $f(x) = x^2 + 6x - 2$ 77. $f(x) = x^3 + 7x$

Use the given functions to evaluate each function composition.

$f(x) = \sqrt{x-3}$ $g(x) = x^2 - 7x + 3$ $h(x) = 2x + 11$

78. $f\big(g(x)\big)$ 78. $g\big(h(x)\big)$ 79. $h\big(g(x)\big)$ 80. $h\big(f(12)\big)$

Simplify each expression:

81. $\frac{1}{2} + \frac{1}{7}$ 82. $\frac{1}{x+2} + \frac{1}{x+4}$ 83. $\frac{1}{x^2-9} - \frac{1}{x-3}$

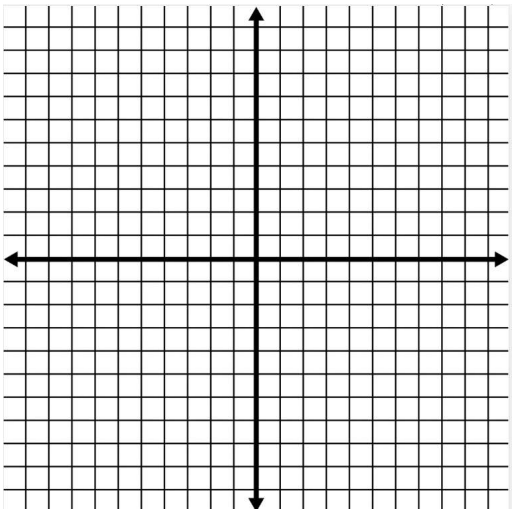
84. $3 - \frac{x-4}{x^2+3x-4} + \frac{2x}{x-1}$ 85. $\frac{1}{x+1} + \frac{1}{x+2} + \frac{1}{x-3}$

Simplify each Radical. Express each answer as an exact answer (no decimals)

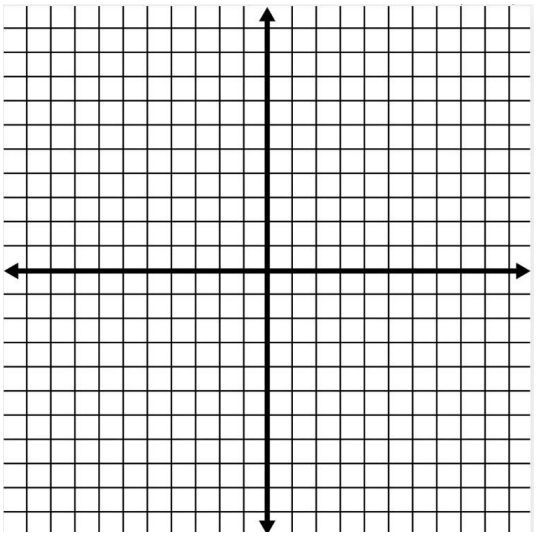
87. $\frac{1}{\sqrt{3}}$ 88 . $\sqrt{\frac{98}{162}}$ 89. $\sqrt[4]{\frac{x^{17}}{x^7}}$ 90. $\sqrt[3]{\frac{1}{81}}$

On the axes provided, sketch the parent function for the following curves. Make sure the graph is to scale and intercepts (if they are present) are plotted properly.

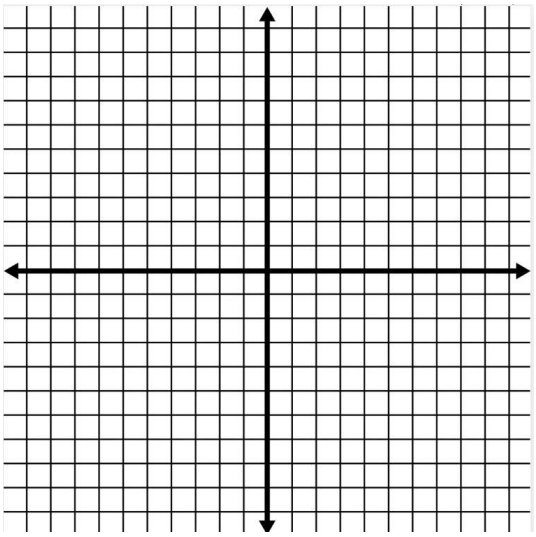
91. $y = x$



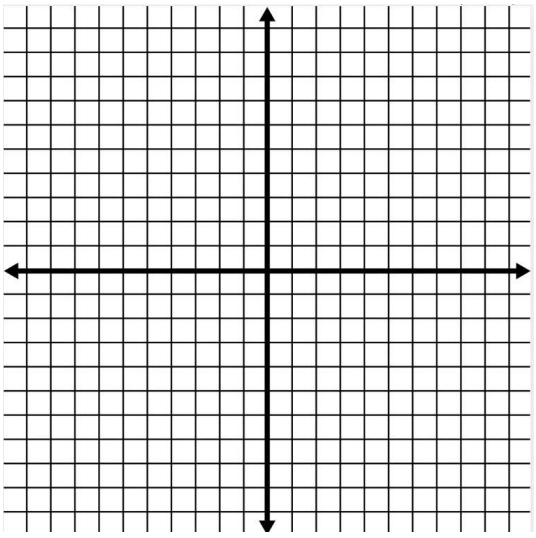
92. $y = |x|$



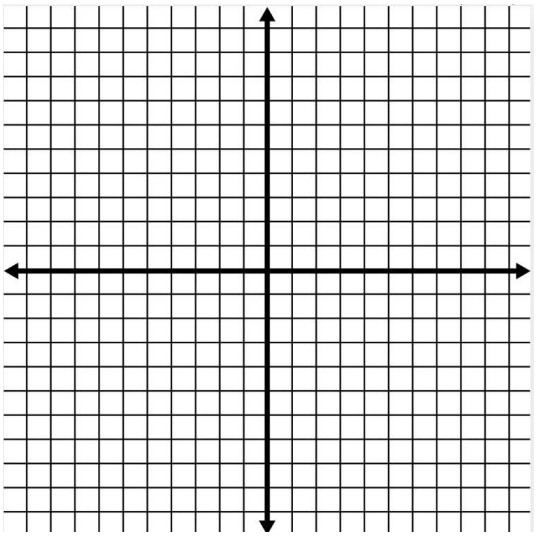
93. $y = \sqrt{x}$



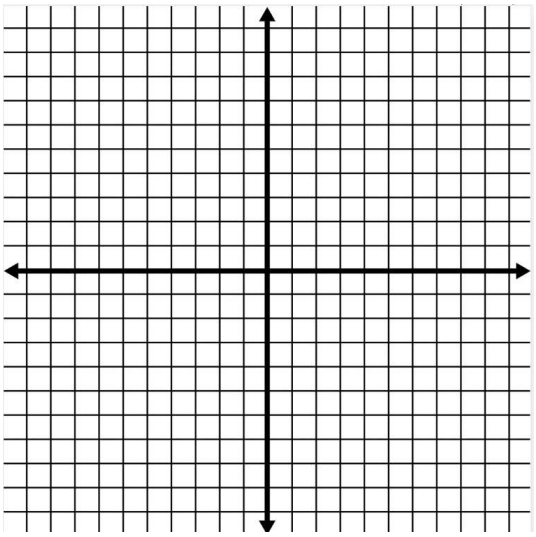
94. $y = \sin x$



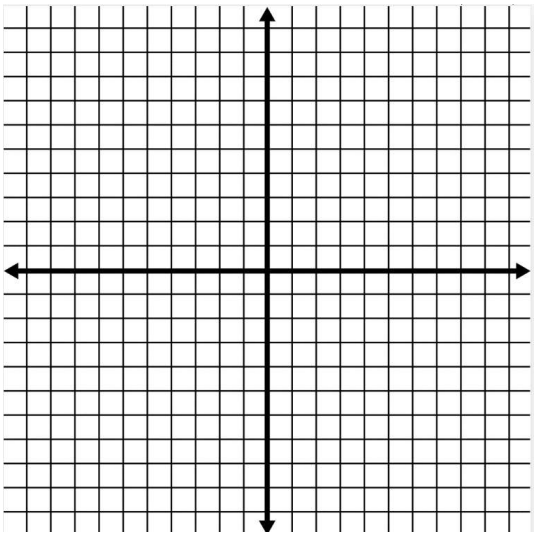
95. $y = \cos x$



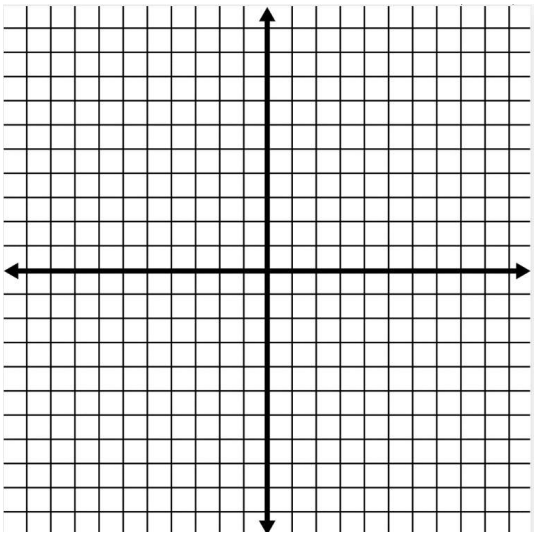
96. $y = \tan x$



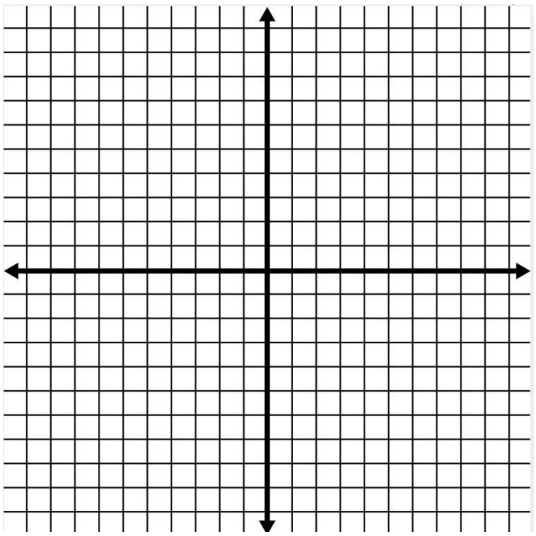
97. $y = \ln x$



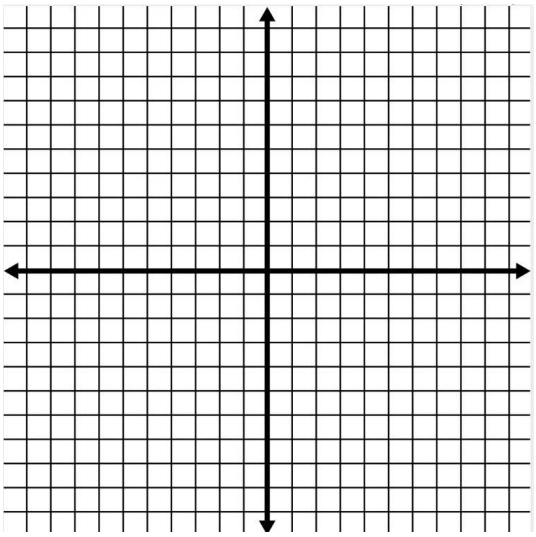
98. $y = e^x$



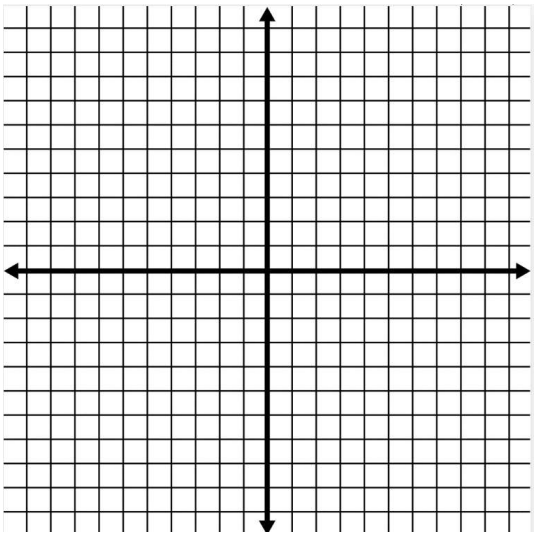
99. $y = x^2$



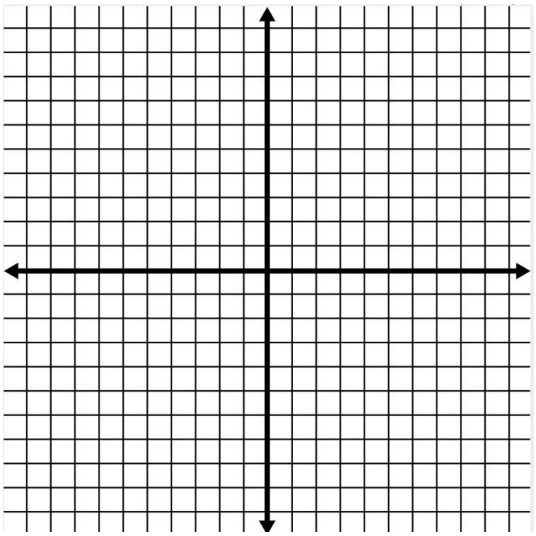
100. $y = x^3$



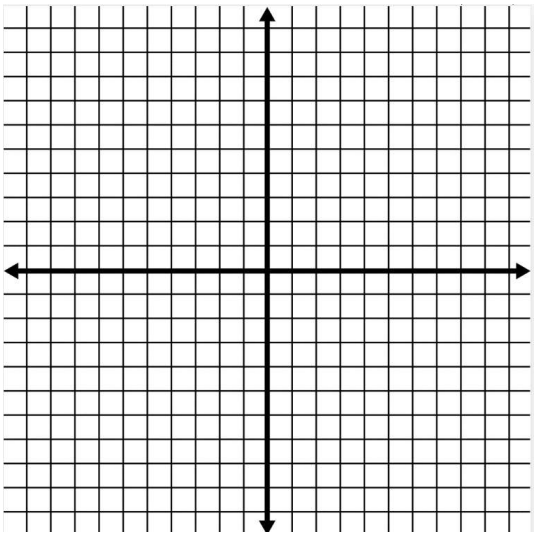
101. $y = \frac{1}{x}$



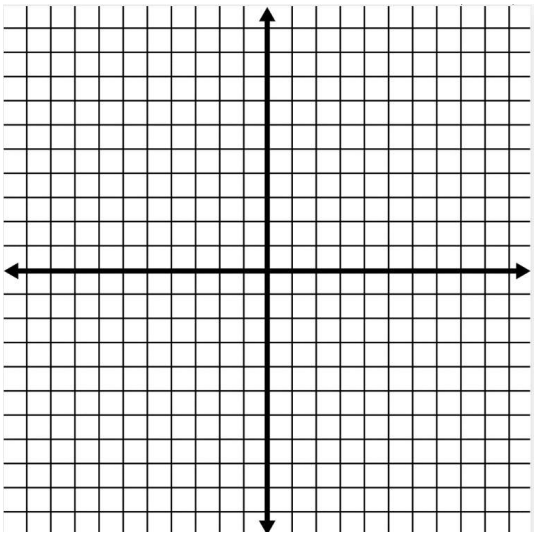
102. $y = e^{-x}$



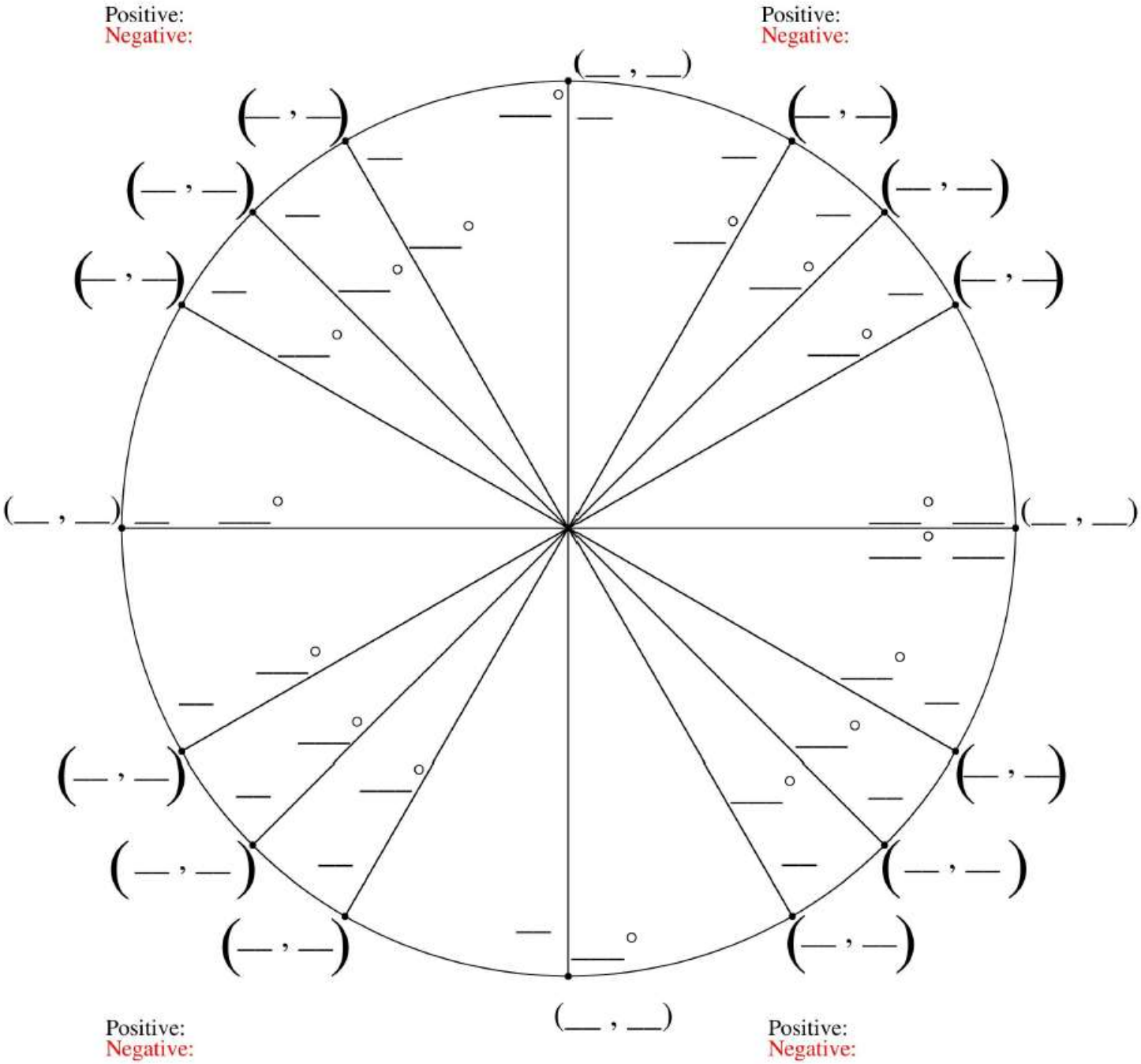
103. $y = 5$



104. $x = 5$



105. Fill out the blank unit circle with all appropriate and exact x and y values (no decimals). Include both radians and degrees on the unit circle, but commit the values in radians to memory- we will but using these, primarily, during the school year.



(AP Calculus only) Write down the four major types of non-degenerate Conic Sections and the general formulae used to plot each conic section in the xy- plane. Plot what these curves look like in the space provided.

106.

107.

108.

109.