

AP Calculus Summer Assignment

Introduction

The AP Calculus course you are about to take is based on your foundation in mathematics – all the math that you have ever learned will come into play in this course. It is possible that some of that material you knew fairly well at one time, but unfortunately, without everyday use, you just plain forgot it. It is also possible that you never really learned it well enough. When you start your AP Calculus course, I assume that you have mastered a lot of the mathematics and techniques that you need to know. For some of you, this is a bad assumption. Unfortunately, there is not enough time to begin the year by reviewing and getting everyone's knowledge at the same level. So to help, this assignment contains much of the material from precalculus that you really need to know going into AP calculus. It will allow you to practice many of the concepts that were in precalculus and are quite likely to show up in AP Calculus. One reason that many students worldwide struggle in AP calculus is because their precalculus abilities are lacking. Spending several hours on this assignment will set you up for a good start in August.

The Assignment

Do each of the 88 problems on your own paper. (Topic C does not include any problems) **For each problem, include valid and appropriate work in support of your result.** Organize your work appropriately, with problem number, necessary work, and result.

This assignment is due on the first day of school: August 19, 2019.

A percentage will be deducted for each day the summer assignment is turned in after the due date.

As well, there will be a quiz dealing with these topics on the first block day of class. As you work on the problems, keep the quiz in mind and plan accordingly.

Your summer work and quiz result will be combined together for a grade.

The topics covered by the summer assignment are listed on a following page. Refer to your notes from previous math classes to assist you. You can also search on-line for help (<https://www.khanacademy.org/> or <http://www.purplemath.com/> for example).

Graphing Calculator

On one of the following pages is a letter with information regarding graphing calculators and their role in the AP Calculus courses.

Topic I – Rational Expressions

Addition, Subtraction, Multiplication, Division of rational expressions

Complex rational expressions

Topic II – Exponents and Radicals

Laws of Exponents

Calculations with exponents and radicals

Conversion between radicals and exponents

Rationalization techniques

Topic III – Linear Equations, Inequalities, Absolute Value

Solution of one and two linear equations

Solution of equations reducible to linear equations

Graphs of linear inequalities

Solution of linear inequalities

Simplification of expressions involving absolute value

Solution of equations and inequalities involving absolute value

Topic IV – Polynomials and Polynomial Equations

Polynomial algebra

Factorization

Completing the square

Solution of polynomial equations by factoring

Solution of quadratic equations by quadratic formula

Graphs of quadratic equations

Solution of quadratic inequalities

Topic V – Functions

Function concept and notation

Function evaluation and composition

Graphs of translations, reflections, and absolute value functions

Topic VI – Trigonometry

Right angle trigonometry

Trigonometric functions and circular functions

Radian and degree measure

Special angles

Trigonometric identities

Graphs of trigonometric functions

Topic VII – Logarithmic and Exponential Functions

Definition and laws of logarithms

Evaluation of logarithmic expressions

Graphs of logarithmic and exponential functions

Inverse relation between logarithm and exponential functions

Logarithmic and exponential equations

Topic VIII – Word Problems

Problems involving percent, average, ratio, and proportion

Problems leading to linear and quadratic equations

Problems from geometry

Topic C – Graphs of Common Functions



DEPARTMENT OF MATHEMATICS



Clavis East High School

May 23, 2019

Dear AP Statistics or AP Calculus student and family:

You are enrolled in Advanced Placement Statistics or AP Calculus for the upcoming school year. In order to be successful, the Advanced Placement College Board suggests that students purchase and become familiar with a graphing calculator. If you are in AP Stats you need one with statistical applications. The one most highly recommended and user friendly for both AP Statistics and AP Calculus is the **TI-84 CE, TI-84 Plus, TI-84 or silver edition**. It highly recommended that each student purchase their own so that they may be taken home to work on assignments outside of class time. This will be the calculator that is used in both courses for demonstration and instructional purposes. This calculator runs about \$90 - \$120. Traditionally the best prices have been at Target, Wal-Mart, Office Depot, Costco or Office Max. Target usually has a great sale the end of July or first part of August during which you can get it for well under \$100. **We will begin using the calculator in class the first day of class.** Specialized instruction will be given during the progress of the courses as we cover the topics in each class. Students who are completing AP Statistics have found it to be an invaluable tool. This is the **only** calculator with all of the statistical functions that are part of the curriculum. It will also serve your student well for AP Calculus and other math courses he/she enrolls in during high school or college. Please contact Mrs. Olson or Mr. teNyenhuis if you are unable to purchase a TI graphing calculator or if you already have a different graphing calculator (email jeriolson@cusd.com or gabrieltenyenhuis@cusd.com after August 9th).

Questions may be directed to the instructors for these courses. A graphing calculator is not required, but is helpful, for the non-AP Statistics course. This calculator is appropriate for all three AP math courses, SAT and ACT exams, as well as college math courses. There is also summer work for each AP math course posted on the REC website under AP courses.

Sincerely,

Mrs. Jeri Olson

Mr. Gabe teNyenhuis

Mathematics Department Chair

Math Team Advisor

AP Statistics Instructor

AP Calculus AB and BC Instructor

Calculus Readiness Sample Test Questions

Topic I – Rational Expressions

Simplify the following:

$$1. \left(\frac{9x^2 - 12x}{x^2 + 1} \right) \left(\frac{2x^2 + 2}{9x^2 + 6x - 24} \right)$$

$$2. \frac{\left(1 - \frac{3}{x} \right)}{9 - x^2}$$

$$3. \left(\frac{6v^3}{u^2} \right) \left(\frac{-uv}{2v} \right) \left(\frac{1}{7v^2} \right)$$

$$4. \frac{-4}{9 - x^2} - \frac{2x + 1}{x^2 - 3x}$$

$$5. \frac{3}{(x+2b)(x-b)} + \frac{2}{(3b-x)(x+2b)} + \frac{1}{(x-3b)(b-x)}$$

$$6. \left(\frac{2a}{b} - \frac{b}{a} \right)^{-2}$$

$$7. \frac{\left(\frac{xy^2}{x+y} \right)}{\left(\frac{x-y}{x^2 - y^2} \right)}$$

$$8. \frac{\left(\frac{m}{m-3} - \frac{2m}{m^2 - 2m - 3} \right)}{\left(\frac{2}{m+1} - \frac{1}{m} \right)}$$

Topic II – Exponents and Radicals

9. Evaluate: $81^{-3/4}$

Simplify the following:

10. $\sqrt{6}\sqrt{15}$

11. $\sqrt{(a+b)(a^2-b^2)}$

12. $\sqrt{16x^2 + 24y^2 + 36z^2}$

13. $\frac{(3xy^{1/2})(4x^2y)^{-2}}{xy^{3/2}}$

14. $\frac{a^{-2}b^3c}{a^{-1}b^{-2}c^0}$

15. $\frac{a^{3x+2}}{a^{4-x}}$

16. $(m^{b+1})^{b-1}$

17. $\left(\frac{4^3 x^{3/2} y^{4/3}}{16x^{-1/2} y^2}\right)^{-1/2}$

18. $(-125x^{18}y^{24})^{2/3}$

19. $(\sqrt[4]{m^6})(2m\sqrt{m})$

20. $2\sqrt{12} + \sqrt{27} - \sqrt{48}$

Rationalize the following:

21. $\frac{x}{\sqrt[5]{4}}$

22. $\frac{\sqrt[3]{x}}{\sqrt[15]{x^2}}$

23. Solve for x : $3^{5x+2} = 27^{x-4}$

Topic III – Linear Equations, Inequalities, and Absolute Value

24. Solve for x : $3x = \frac{a}{b}(x-1)$

25. Solve for a : $\sqrt{a-2} + 3 = 7$

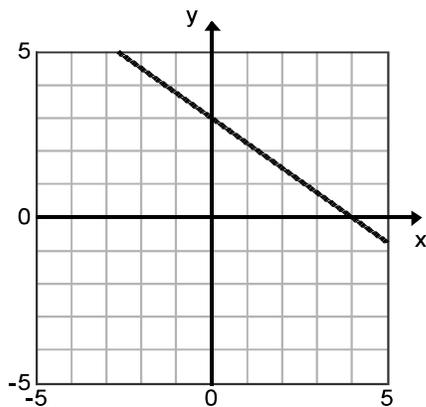
26. Solve for x : $\frac{3}{x} - \frac{2}{x+1} = \frac{5x+3}{x+1}$

27. Solve this system of equations: $\begin{cases} 2x+3y=-5 \\ 5x-2y=8 \end{cases}$

28. Solve this system of equations: $\begin{cases} 3x=4y \\ 2x+3y=17 \end{cases}$

29. If $m = -3$, evaluate $|3-m| + |-4| - |-m|$

30. Find an equation of this line:



31. Solve for x : $|5-2x| \leq 3$

32. Given the points (1, 1) and (3, 4), find the area of the right triangle formed by the line through those points, the x-axis, and $x = 3$.

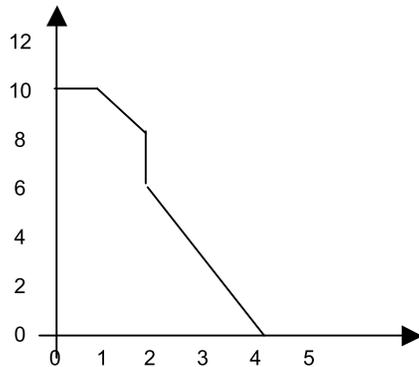
Topic IV – Polynomials and Polynomial Equations

33. Solve for x : $x - 6x^{\frac{1}{2}} + 5 = 0$
34. Solve for x : $-4x^2 + 12x + 3 = 0$
35. Solve for x : $(x-2)(x-3) = 2$
36. If you wanted to complete the square for $x^2 - 3x = 2$, what would you add to both sides?
37. Solve for x : $2 = \sqrt{2x-5} - \sqrt{x-2}$
38. Simplify: $\frac{x^4 - 14x^2 + 3x + 34}{x-2}$
39. Find the values of a so that the following has 2 distinct real roots: $2ax^2 - 12x - 7$
40. Solve for x : $x^2 - x - 42 > 0$
41. Graph: $y = x^2 - x - 6$
42. Graph: $|x+2| = y$
43. Graph: $y = 2^x + 1$
44. Graph: $y = \frac{2}{x}$
45. If $x = 3$, $y = -1$, and $z = -2$, evaluate $\frac{x^2 - xy^2z}{z^2y^2 - xz}$
46. Find the vertical and horizontal asymptotes of $f(x) = \frac{x+1}{(2x-1)(x+3)}$

Topic V – Functions

47. Find $f(0)$ when $f(x) = \frac{3x^3 - 4x + 5}{ax^2 + bx - 2}$
48. If $f(x) = -\frac{2}{x-1}$, find $f\left(\frac{1}{x+3}\right)$.
49. If $f(x) = x^2 - 1$ and $g(x) = 2x + 1$, find a) $f(g(x))$ and b) $g \circ f(x)$

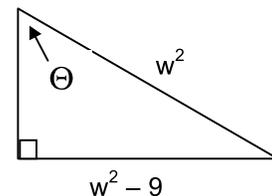
50. If $f(x) = \frac{3x+2}{2x-1}$, for what x does $f(x) = -3$?
51. Find $\frac{4}{f(3)}$ if $f(t) = \frac{t^2-1}{2t-2}$
52. Graph: $f(x) = \frac{1}{2x+1}$
53. Graph: $f(x) = |x^2 - 2|$
54. Find the domain and range of $g(x) = \sqrt{x^2 - 2x - 5}$
55. Express the domain and range of $g(x) = (25 + 4x - x^2)^{1/2}$ in interval notation (with exact answers, no decimals).
56. Find the area of the interior region of this figure:



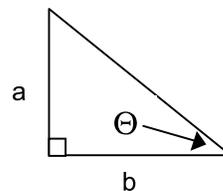
57. Let $f(x) = 3x - 5$. If $3f(a) = f(2a + 1)$, then $a =$

Topic VI – Trigonometry

58. Find $\cos \theta$ in the given triangle.

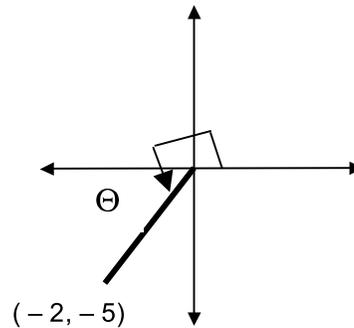


59. Use this triangle to find $\cot \theta \sin \theta$.



60. Evaluate: $\cos(\Theta + \pi)$
61. Verify this identity: $\sec \Theta - \cos \Theta = \tan \Theta \sin \Theta$
62. Graph the function: $y = \frac{3}{2} \cos(2x)$
63. Graph: $y = \sin\left(\frac{x}{2}\right)$

64. In the figure shown, find $\csc \Theta$.



65. Express 114° in radians.
66. Which trig functions are even?
67. Find $\sin^{-1}\left(\frac{\sqrt{12}}{4}\right)$.
68. Find $\cos\left(\frac{5\pi}{3}\right)$.

Topic VII – Logarithmic and Exponential Functions

69. Solve for b : $\log_a b = x$
70. Solve for x : $2^x = 5$
71. Evaluate: $\log_{36} \sqrt[3]{6}$
72. Evaluate: $\log_9 \left(\frac{9^6}{27}\right)$

73. Simplify: $\log(a^2b) - \log(2a) + \log(b)$

74. Solve for x : $5^{3x} - \frac{1}{25} = 0$

75. Solve for y : $\log_4(3y - 5) = 2$

76. Graph: $y = \left(\frac{1}{3}\right)^{-x}$

77. Graph: $x = \log_2(y + 3)$

Topic VIII – Word Problems

78. A bakery has a special on peanut butter cookies and chocolate chip cookies. There are 12 dozen cookies on special. If there are 40% more chocolate chip cookies than peanut butter cookies, how many chocolate chip cookies are there?

79. A 24w by 36L inch poster is enlarged so that its length is 5 ft. What is its width?

80. The circumference of a circle is quadrupled. How much is the area increased?

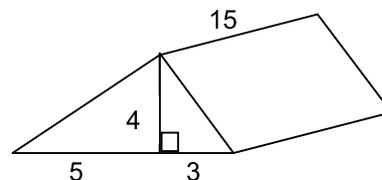
81. The sum of two numbers is $179\frac{1}{2}$. Six times the first number minus seven times the second number is 778. Find the numbers.

82. The cube root of a number is squared and the result is 16. What is the number?

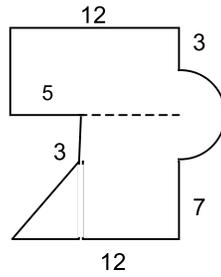
83. The price of an airplane ticket is decreased 16% to \$193.20. What was the original price?

84. If the radius of a circle is decreased by 15%, what is the percent decrease in the area of the circle?

85. What is the surface area of the given triangular prism?



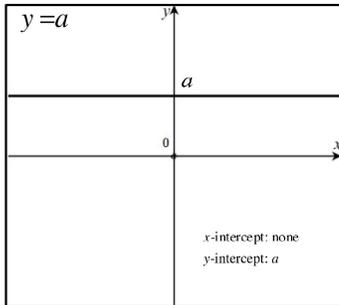
86. Find the area of the given figure to the nearest tenth of a unit.



87. How long does it take something to travel 500 meters at 42 meters per second?
88. A tree twenty-five feet tall casts a shadow that is 35 feet long. If the shadow of a nearby building is 119 feet long, how tall is the building?

C. Graphs of Common Functions

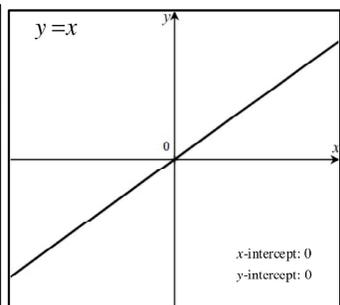
There are certain graphs that occur all the time in calculus and students should know the general shape of them, where they hit the x -axis (zeros) and y -axis (y -intercept), as well as the domain and range. There are no assignment problems for this section other than students memorizing the shape of all of these functions. In section 5, we will talk about transforming these graphs.



Function: $y = a$

Domain: $(-\infty, \infty)$

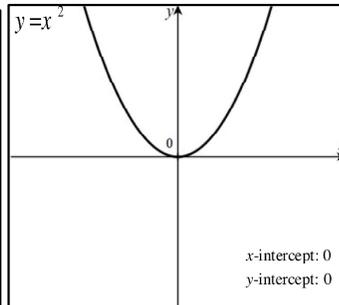
Range: $[a, a]$



Function: $y = x$

Domain: $(-\infty, \infty)$

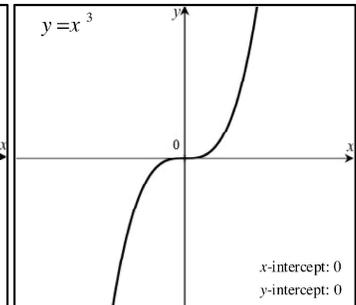
Range: $(-\infty, \infty)$



Function: $y = x^2$

Domain: $(-\infty, \infty)$

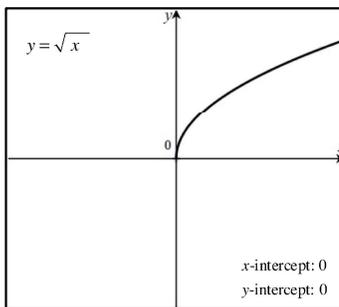
Range: $[0, \infty)$



Function: $y = x^3$

Domain: $(-\infty, \infty)$

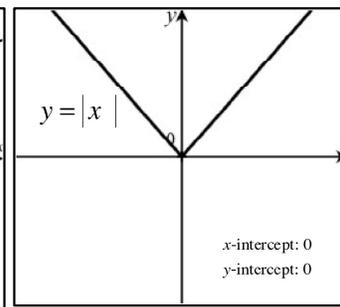
Range: $(-\infty, \infty)$



Function: $y = \sqrt{x}$

Domain: $[0, \infty)$

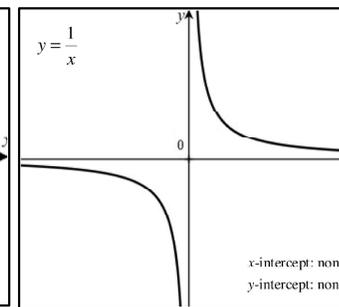
Range: $[0, \infty)$



Function: $y = |x|$

Domain: $(-\infty, \infty)$

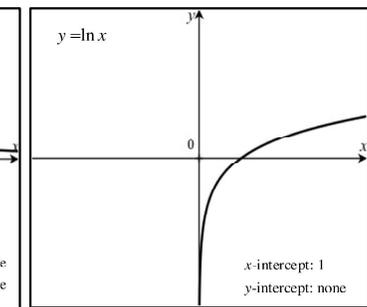
Range: $[0, \infty)$



Function: $y = \frac{1}{x}$

Domain: $x \neq 0$

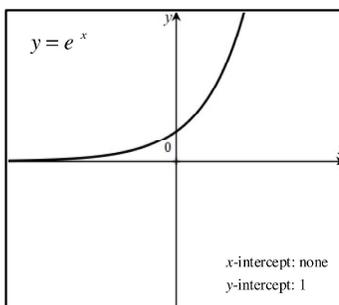
Range: $y \neq 0$



Function: $y = \ln x$

Domain: $(0, \infty)$

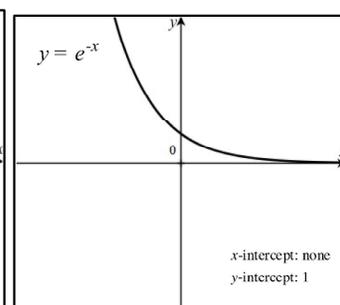
Range: $(-\infty, \infty)$



Function: $y = e^x$

Domain: $(-\infty, \infty)$

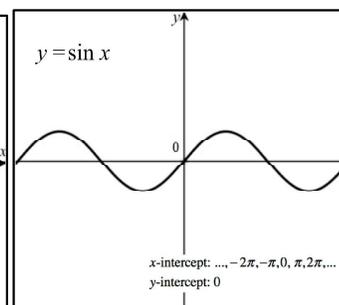
Range: $(0, \infty)$



Function: $y = e^{-x}$

Domain: $(-\infty, \infty)$

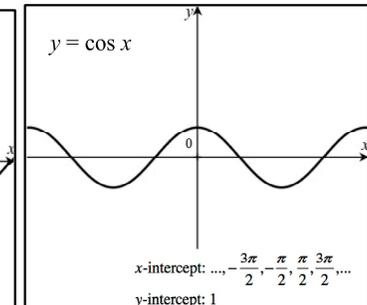
Range: $(0, \infty)$



Function: $y = \sin x$

Domain: $(-\infty, \infty)$

Range: $[-1, 1]$



Function: $y = \cos x$

Domain: $(-\infty, \infty)$

Range: $[-1, 1]$