

AP Calculus AB Summer Assignment:

Your summer assignment will be due on the first day of school.

****For each day late, 5 points will be deducted from the total value.****

All work must be done in pencil and be done on notebook paper. All work must be shown in order to receive full credit.

Welcome to AP Calculus!

You have chosen to participate in a College Level Mathematics course. Please recognize that taking this class is a major commitment and requires a lot of work. This is an exciting, challenging, fast paced course. Honesty and integrity are crucial at this level of education and are demanded in the course. We have a lot of material to cover before the AP exam in May and, as such, we cannot spend a lot of time in class reviewing prerequisite material. AP Calculus will cover the two branches of a typical Calculus course: derivatives and integrals along with associated applications. Students will have an understanding of all topics analytically, graphically, numerically, and verbally. Assessments include quizzes, tests, group work, and projects. Activities are completed throughout the year in addition to practicing problems from supplementary materials.

Prerequisites:

Before studying calculus, all students should complete courses in which they study algebra, geometry, elementary functions, and trigonometry. These functions include those that are linear, polynomial, rational, exponential, logarithmic, trigonometric, inverse trigonometric, and piecewise defined. In particular, before studying calculus, students must be familiar with the properties of functions, the algebra of functions and the graphs of functions. Student must also understand the language of functions (domain and range, odd and even, periodic, symmetry, zeros, intercepts, etcetera) and know the values of the trigonometric functions of the numbers 0 , $\pi/6$, $\pi/4$, $\pi/3$, $\pi/2$, and their multiples. Know your trig! Trig will often show up in the middle of a problem and the faster you are with your facts, the better equipped you will be to solve problems!

Course Goals:

Students should be able to:

- Work with functions represented in a variety of ways: graphical, numerical, analytical, or verbal. They should understand the connections among these representations.
- Understand the meaning of the derivative in terms of a rate of change and local linear approximation and they should be able to use derivatives to solve a variety of problems.
- Understand the meaning of the definite integral both as a limit of Riemann sums and as the net accumulation of change and should be able to use integrals to solve a variety of problems.

- Understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.
- Model a written description of a physical situation with a function, a differential equations, or an integral.
- Understand the connections of calculus to other disciplines through use of calculus to solve physics problems as well as applications of calculus.
- Use technology to help solve problems, experiment, interpret results, and verify conclusions.
- Develop an appreciation of calculus as a coherent body of knowledge and as a human accomplishments.

Materials:

Here are a few things you should be prepared to have - not necessarily the first day of school - but within the first week:

- 1 large 3 ring binder (1.5" or more)
 - Dividers (recommended)
- Pencils, pens, erasers, highlighters
- Notebook paper
- TI-83, TI-84, or TI-89 Calculator
- Ruler (6" is recommended)
- Laptop or Electronic Device (iPad with keyboard)

Overall, my wish is that you gain an understanding and appreciation of the concepts presented in this course and be able to step confidently into your next Calculus classrooms.

Quick Blurb About Assignment:

As stated previously, the year must be devoted to topics in differential and integral calculus. Therefore, the summer assignments listed below are designed to help you review topics from algebra, geometry, and pre-calculus so that when you arrive on the first day of class, you are ready to begin with the first main theme in calculus.

The summer assignment for AP Calculus AB is a review of functions, limits, and graphing calculator procedures. This work will serve as an example of the type of assignments and effort that will be expected of you throughout the next school year. This assignment will be reviewed and marked as homework but there will be a quiz based on the summer assignment material on the first week of classes (date to be determined).

The following websites will be useful to you in completing the assignment and preparing to learn new material:

<http://archives.math.utk.edu/visual.calculus/>

<http://www.calculus-help.com/tutorials/>

<http://www.centerofmath.org/videos/index.html#subject4>

<http://www.learningpod.com/browse/category/topic/calculus/92>

<https://www.khanacademy.org>

http://www.chatoicgolf.com/tutorials_calc_aaahs.html

You may contact me over the summer at mclark@nazarethacademyhs.org if you have any questions. (Do not wait until last minute to complete this assignment)

Graphs and Models:

Find any intercepts.

1.) $y = 2x - 5$

2.) $y = 4x^2 + 3$

3.) $y = x^2 + x - 2$

4.) $y^2 = x^3 - 4x$

5.) $y = x\sqrt{16 - x^2}$

6.) $y = (x - 1)\sqrt{x^2 + 1}$

7.) $y = \frac{2 - \sqrt{x}}{5x}$

8.) $y = \frac{x^2 + 3x}{(3x + 1)^3}$

9.) $y = 2x - \sqrt{x^2 + 1}$

Find the points of intersection of the graphs of the equations.

10.) $y = x^3 - 2x^2 + x - 1$

11.) $y = x^4 - 2x^2 + 1$

12.) $y = \sqrt{x + 6}$

$y = -x^2 + 3x - 1$

$y = 1 - x^2$

$y = \sqrt{-x^2 - 4x}$

Match the equation or equations with the given characteristic.

13.) $y = 3x^3 - 3x$

a.) Symmetric with respect to the y-axis

14.) $y = (x + 3)^2$

b.) Three x-intercepts

15.) $y = 3x - 3$

c.) Symmetric with respect to the x-axis

16.) $y = \sqrt[3]{x}$

d.) $(-2, 1)$ is a point on the graph

17.) $y = 3x^2 + 3$

e.) Symmetric with respect to the origin

18.) $y = \sqrt{x + 3}$

f.) Graph passes through the origin

Functions and Their Graphs:

Evaluate (if possible) the function at the given value(s) of the independent variable. Simplify the results,

19.) $f(x) = 7x - 4$

a.) $f(0)$

b.) $f(-3)$

c.) $f(b)$

d.) $f(x - 1)$

20.) $f(x) = \sqrt{x + 5}$

a.) $f(-4)$

b.) $f(11)$

c.) $f(-8)$

d.) $f(x + \Delta x)$

21.) $g(x) = 5 - x^2$

a.) $g(0)$

b.) $g(\sqrt{5})$

c.) $g(-2)$

d.) $g(t - 1)$

22.) $g(x) = x^2(x - 4)$

a.) $g(4)$

b.) $g(\frac{3}{2})$

c.) $g(c)$

d.) $g(t + 4)$

23.) $f(x) = \cos 2x$

a.) $f(0)$

b.) $f(-\frac{\pi}{4})$

c.) $f(\frac{\pi}{3})$

24.) $f(x) = \sin x$

a.) $f(\pi)$

b.) $f(\frac{5\pi}{4})$

c.) $f(\frac{2\pi}{3})$

Given $f(x) = \sin x$ and $g(x) = \pi x$, evaluate each expression.

25.) $f(g(2))$

26.) $f(g(\frac{1}{2}))$

27.) $g(f(0))$

28.) $g(f(\frac{\pi}{4}))$

29.) $f(g(x))$

30.) $g(f(x))$

Find the composite functions $(f \circ g)$ and $(g \circ f)$. What is the domain of each composite function. Are the two composite function equal?

31.) $f(x) = x^2$

$g(x) = \sqrt{x}$

32.) $f(x) = x^2 - 1$

$g(x) = \cos x$

33.) $f(x) = \frac{3}{x}$

$g(x) = x^2 - 1$

Solve the equations below for x and show your work. Recall that $\ln(x) = \log_e(x)$ and

$\log(x) = \log_{10}(x)$

34.) $\log_2(x) = 4$

35.) $\log_3(x) = -3$

36.) $\log_{64}(x) = \frac{1}{2}$

37.) $\log_6(2x - 4) = 2$

38.) $2\ln(x) + 3 = 4$

39.) $3\log(3x - 2) = 3$

Trigonometric Functions:

Recall the six trigonometric functions: **sine, cosine, tangent, secant, cosecant, cotangent.**

Below are some definitions for the trigonometric functions:

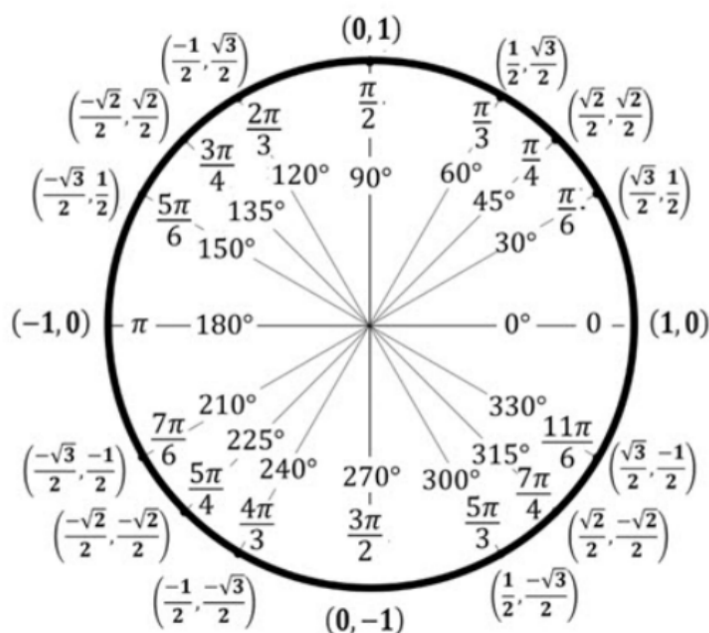
$$\tan x = \frac{\sin x}{\cos x}$$

$$\sec x = \frac{1}{\cos x}$$

$$\csc x = \frac{1}{\sin x}$$

$$\cot x = \frac{1}{\tan x}$$

$$\cot x = \frac{\cos x}{\sin x}$$



Evaluate the following using the definition above and the unit circle.

40.) $\tan(\frac{\pi}{6})$

41.) $\tan(0)$

42.) $\tan(\frac{\pi}{4})$

43.) $\tan(\frac{\pi}{3})$

44.) $\tan(\frac{\pi}{2})$

45.) $\sec(\frac{\pi}{6})$

46.) $\sec(0)$

47.) $\sec(\frac{\pi}{4})$

48.) $\sec(\frac{\pi}{3})$

49.) $\sec(\frac{\pi}{2})$

50.) $\csc(0)$

51.) $\csc(\frac{\pi}{4})$

52.) $\csc(\frac{\pi}{6})$

53.) $\cot(\frac{\pi}{2})$

54.) $\cot(\frac{\pi}{6})$

55.) $\cot(0)$

Congratulations! You have completed the AP Calculus AB summer assignment!