



West Potomac High School
6500 Quander Road
Alexandria, VA 22307



Dear AP Calculus BC Student,

Welcome to AP Calculus! This course is primarily concerned with developing your understanding of the concepts of calculus and providing experience with its methods and applications. The course emphasizes a multi-representational approach to calculus, with concepts, results, and problems being expressed graphically, numerically, analytically, and verbally. In order to be successful in this course you need the proper foundation. (i.e., knowledge of algebra, geometry, trigonometry, analytic geometry, and elementary functions). You will have to be very familiar with the basic families of functions, and all of their representations, in order to be successful in your study of calculus. The concept of functions underlies everything that calculus considers.

You will also need to be able to carry out certain computational tasks (i.e., algebra skills) with efficiency and accuracy if you are going to be successful in calculus. These include manipulations of functional symbolism, solving algebraic equations involving the functions mentioned above, interpreting numerical values given by formulas, graphs, and tables, using and manipulating data, and knowing how, and when to use your calculator.

This is a rigorous college course. The curriculum and pace of the course is intense and all enrolled students are expected to take the AP exam. Since this is a *college class* you can expect to spend approximately 1-2 hours completing homework or studying for every hour that you are in class learning. Therefore, this course will be challenging and demanding.

While there is not a formal packet for you to complete over the summer, please be advised that on the **first day** of school you will be receiving a **Take Home Test** that will be **due on the 3rd day of class**. The take home test will cover the following concepts and skills: algebra, geometry, trigonometry, functions, and the basic understanding of limits (i.e., your pre-calculus skills). Moreover, **you will be *tested* on this material throughout the entire year**, so it is in your best interest to review the sample questions provided on the subsequent pages, and prepare yourself prior to the first day of school. Again, while you are not required to complete any of these problems (this will not be graded), be advised that these are the skills that we expect you to possess prior to the first day of school. Therefore, if you are unable to answer some of these questions, I suggest that you start studying!

Feel free to contact me with any questions or concerns that you or your parents may have. Have a restful summer and be ready for an exciting time in AP Calculus BC next year.

Sincerely,

Allison Satterwhite

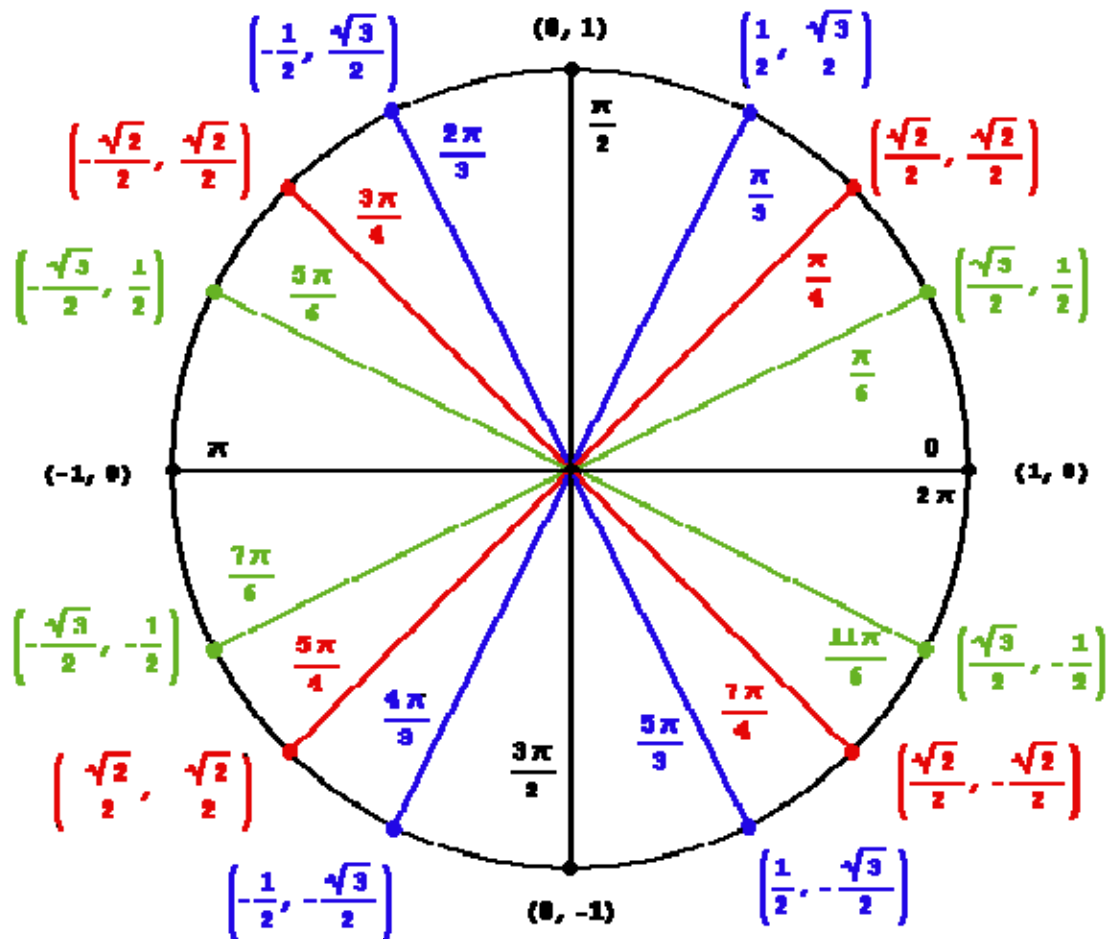
allison.satterwhite@fcps.edu

The following Trigonometric Identities **MUST** be **memorized**

Reciprocal Identities	Quotient Identities	Pythagorean Identities										
$\sin x = \frac{1}{\csc x} \quad \csc x = \frac{1}{\sin x}$ $\cos x = \frac{1}{\sec x} \quad \sec x = \frac{1}{\cos x}$ $\tan x = \frac{1}{\cot x} \quad \cot x = \frac{1}{\tan x}$	$\tan x = \frac{\sin x}{\cos x}$ $\cot x = \frac{\cos x}{\sin x}$	$\sin^2 x + \cos^2 x = 1$ $\tan^2 x + 1 = \sec^2 x$ $1 + \cot^2 x = \csc^2 x$										
Co-Function Identities	Odd/Even Identities											
$\sin\left(\frac{\pi}{2} - \theta\right) = \cos \theta \quad \cos\left(\frac{\pi}{2} - \theta\right) = \sin \theta$ $\csc\left(\frac{\pi}{2} - \theta\right) = \sec \theta \quad \sec\left(\frac{\pi}{2} - \theta\right) = \csc \theta$ $\tan\left(\frac{\pi}{2} - \theta\right) = \cot \theta \quad \cot\left(\frac{\pi}{2} - \theta\right) = \tan \theta$	<table style="width: 100%; border: none;"> <tr> <td style="text-align: center; width: 50%;"><u>Odd</u></td> <td style="text-align: center; width: 50%;"><u>Even</u></td> </tr> <tr> <td>$\sin(-\theta) = -\sin \theta$</td> <td>$\cos(-\theta) = \cos \theta$</td> </tr> <tr> <td>$\csc(-\theta) = -\csc \theta$</td> <td>$\sec(-\theta) = \sec \theta$</td> </tr> <tr> <td>$\tan(-\theta) = -\tan \theta$</td> <td></td> </tr> <tr> <td>$\cot(-\theta) = -\cot \theta$</td> <td></td> </tr> </table>		<u>Odd</u>	<u>Even</u>	$\sin(-\theta) = -\sin \theta$	$\cos(-\theta) = \cos \theta$	$\csc(-\theta) = -\csc \theta$	$\sec(-\theta) = \sec \theta$	$\tan(-\theta) = -\tan \theta$		$\cot(-\theta) = -\cot \theta$	
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Double Angle Identities	Half Angle Identities											
$\sin 2x = 2 \sin x \cos x$ $\cos 2x = \cos^2 x - \sin^2 x$ $\cos 2x = 2 \cos^2 x - 1$ $\cos 2x = 1 - 2 \sin^2 x$	$\sin^2 x = \frac{1 - \cos 2x}{2}$ $\cos^2 x = \frac{1 + \cos 2x}{2}$											

The Radian Measures and Coordinates **MUST** be memorized

Remember: $\sin \theta = \frac{y}{r} = y - \text{coordinate}$, $\cos \theta = \frac{x}{r} = x - \text{coordinate}$, and $\tan \theta = \frac{y}{x} = \frac{y - \text{coordinate}}{x - \text{coordinate}}$



Fill in the following table of Inverse Trig function values:

Values of inverse sine and inverse cosine (in radians)									
x=	-1	$-\frac{\sqrt{3}}{2}$	$-\frac{\sqrt{2}}{2}$	$-\frac{1}{2}$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\sin^{-1}(x)$									
$\cos^{-1}(x)$									

Values of inverse tangent (in radians)							
x=	$-\sqrt{3}$	-1	$-\frac{\sqrt{3}}{3}$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$
$\tan^{-1}(x)$							

Here are some sample questions for you to look over and review. You are not required to complete any of these problems (this will not be graded) but be advised that these are the skills that we expect you to possess prior to the first day of school.

**ALL of these questions are to be completed
without the use of a calculator**

I. Algebraic Manipulation

Simplify the expression

1. $x(2x + 3(x - (2x + 1)))$

2. $\frac{\sqrt{x}}{\sqrt{x} + 3}$

3. $\frac{(9x^2 + 3x - 2)}{(9x^2 - 1)} \cdot \frac{(3x^2 + 13x + 4)}{(27x^3 + 8)}$

4. $\frac{x + \frac{1}{y}}{y + \frac{1}{x}}$

II. Solving Equations

5. $1 - \frac{3}{x} = \frac{4}{5}$

6. $\frac{x+1}{3x-1} + \frac{2x+1}{3x-2} = -1$

7. $x^4 - 13x^2 + 37 = 7$

8. $x^3 - 4x^2 + x + 6 = 0$

III. Exponents and Logarithms

9. Solve for x : $\log_3(x-1) = 2$

10. Solve for x : $3^x \cdot 3^{x+1} = 9$

11. Evaluate: $2\log_2 4 + \frac{1}{2}\log_2 5 - \frac{1}{2}\log_2 20$

12. Graph: $y = \log_2(x-1) + 3$

IV. Functions and Graphs

13. If $f(x) = \frac{x}{1-x}$, find $f\left(\frac{1}{x}\right)$

14. If $f(x) = \frac{x}{1-x}$, find $f(1-x)$

15. Sketch the graph of $y = x^2 - 2x$

16. Sketch the graph of $f(x) = \frac{x^2 + x - 6}{x - 2}$
and state Domain and Range.

17. Sketch the graph of $f(x) = \ln(x-1)$
and state Domain and Range.

18. Sketch the graph of $2y = \sqrt{36 - 9x^2}$

19. Sketch the graph of $f(x) = \begin{cases} \sqrt{4-x} & x \leq 0 \\ 2-3x & 0 < x \leq 2 \\ x^2 & x > 2 \end{cases}$

20. Sketch the graph of $f(x) = e^x$

Evaluate this function at the following values:

a. $f(-2) =$ _____ b. $f(0) =$ _____ c. $f(2) =$ _____

V. Trigonometry

21. Graph $y = 2 \cos 3\theta - 1$

22. Find $\sin\left(\frac{7\pi}{6}\right)$

23. Evaluate $\tan\left(-\frac{5\pi}{3}\right)$

24. Evaluate $\cos^{-1}(-1)$

25. Solve: $\tan x = 2 \sin x$

26. Solve: $2 \sin^2 \theta - \cos \theta = 1$

VI. Limits

Find the limit

27. $\lim_{x \rightarrow 2} \frac{(x-3)}{(x-4)}$

28. $\lim_{x \rightarrow \pi} \frac{\cos 2x}{\cos x}$

29. $\lim_{x \rightarrow -2} \frac{x+2}{x^2 + 5x + 6}$

30. $\lim_{x \rightarrow 0} \frac{x}{5 \sin x}$

VII. Miscellaneous

32. Rewrite each of the following interval notations as an inequality (use whatever variable you like).

a. $[-5, 2]$ _____

b. $[0, 6)$ _____

c. $(-2, \infty)$ _____

d. $(3, 10)$ _____

e. $(-\infty, 8]$ _____

33. Use a “sign graph” to write the solution for each of the following inequalities:

a. $(x+1)(x-7) > 0$

b. $\frac{x(12-4x)(2x+5)}{x-6} \geq 0$

34. Complete the definition for absolute value below:

$$|a| = \begin{cases} \text{_____,} & \text{_____.} \\ \text{_____,} & \text{_____.} \end{cases}$$

35. Use the definition in number 3 to rewrite the following **without** absolute value bars:

$$|2x^2 - x - 3| = \begin{cases} \text{_____,} & \text{_____.} \\ \text{_____,} & \text{_____.} \end{cases}$$

36. Given the two points $P(-2, 8)$ and $Q(5, -1)$, calculate the slope of \overline{PQ} . $m =$ _____

37. Given line l contains the point $P(-2, 8)$ and has slope $-3/4$.

a. Write the equation of the line in point-slope form below _____

b. Write the equation of a line m perpendicular to the line l at point P . _____

38. Rewrite each of the following as a compound inequality:

a. $|x| \geq 7$ _____

b. $|x| < 7$ _____

39. Write an expression using absolute value for all the numbers/points, x , on a number line that are:

- a. A distance of 5 units from the number 3 _____
- b. More than or equal to a distance of 5 units from the number 3 _____
- c. Within a distance of 5 units from the number 3 _____

40. Write an example of each type of number:

- c. Counting (or Natural) number: _____
- d. Whole number that is **not** a Natural number: _____
- e. Integer that is **not** a Whole number: _____
- f. Rational number that is **not** an Integer: _____
- g. Algebraic Irrational number: _____
- h. Transcendental Irrational number: _____

39. Given $g(x) = |6 - 2x|$. Rewrite $g(x)$ as a piecewise function without absolute value bars.

$$g(x) = \underline{\hspace{10em}}$$

VIII. Recommended Additional Work from the Calculus text:

- You may check out a Calculus textbook from Ms. Satterwhite in room 208 in upstairs Gunston, on or after June 10th. You should thoroughly **read** the following sections and pick and choose from the suggested problems listed. Answers to these problems can be found in the back of the book.
 - Appendix A *Intervals, Inequalities, Absolute Values*: pg. A2-A9
 - o pg. A9 #7-27 odd, 33, 47, 49
 - Appendix B *Coordinate Geometry and Lines*: pg. A10-A15
 - o pg. A15 #3, 9, 21, 25, 27, 29, 31, 35
 - Appendix C *Graphs of 2nd Degree Equations*: A16-123
 - o pg. A23 #1, 3, 11, 13, 15, 19
 - Appendix D *Trig Review*: pg. A24-A34
 - o pg. A34-A36 #1-13 odd, 19-29 odd, 35, 65, 67, 73, 83, 85, 89, 95
 - Chapter 1 *Functions and Models*: pg. 10-60
 - Pg. 22-23 #1, 5, 7, 9, 21-27 odd, 33-45 odd
 - Pg. 36-38 #3, 7, 9, 13, 19
 - Pg. 46-48 #3, 5, 11, 13, 15, 21, 27, 31, 35, 39, 41, 45, 47, 53
 - Pg. 55 #25, 27
 - Pg. 63 #5, 7, 9