GRACE
Christian School

AP Calculus BC Summer Assignment

Welcome to AP Calculus BC! I am looking forward to our time together this year! To get the most out of this course you need to be competent in Algebra, Precalculus, and AP Calculus AB topics, and most importantly, you must be willing to explain your answers, not simply get the correct answer. Please read more about what you can expect from the course and how you can use AP Calculus BC in the future on Collegeboard's website.

The summer assignment is meant to review content from both Precalculus and AP Calculus AB that you need in order to be successful this year. This assignment should be completed by the due dates listed in the calendar below. Please take a clear picture of your assignment and email it to me by the due date. I will respond with solutions so that you can check your work. If you have a conflict develop that may prevent you from completing the work, you must contact Mrs. Stone via email as soon as possible.

If you need to contact me over the summer, my email address is: mstone@gracechristian.net.

Assignment Instructions

1. Read each section in Chapter 2 by the due date. You must take handwritten notes using the note sheet below (**Attachment A**).
2. Complete each corresponding problem set by the due date. The exercises are attached (**Attachment B**). You must show all of your work.
3. You should have the unit circle memorized by the first day of class (**Attachment C**). Be prepared for a quiz within the first week of school.
4. You should use the attached flashcards to recall Precalculus facts that you will need this year (**Attachment D**). Be prepared for a quiz within the first week of school.

Have a wonderful summer!

Mrs. Stone

Calendar of Due Dates

Assignment	Due Date
Read Section 2.1 and take notes.	July 8
Complete Section 2.1 Exercises.	July 8
Read Section 2.2 and take notes.	July 15
Complete Section 2.2 Exercises.	July 15
Read Section 2.3 and take notes.	July 22
Complete Section 2.3 Exercises.	July 22
Read Section 2.4 and take notes.	July 29
Complete Section 2.4 Exercises.	July 29

Attachment A

Section 2.1 Notes

1. How do you find **average speed**?
2. Complete Example 1.
3. What is the difference between **average speed** and **instantaneous speed**?
4. Complete Example 2.
5. Define **limit**.
6. List the Properties of Limits.
7. Complete Example 3.
8. Complete Example 4.
9. Complete Example 5.
10. Why does the limit in Example 6 not exist?
11. What are **right-hand** and **left-hand** limits?
12. Explain what Theorem 3 says in your own words.
13. Explain each of the limits in Example 8.
14. Write out the Sandwich Theorem
15. Complete Example 9.

Section 2.2 Notes

1. Define **horizontal asymptote**.
2. Complete Example 1 NUMERICALLY (using knowledge of limits).
3. Complete Example 2 using the Sandwich Theorem.
4. List the Properties of Limits.
5. Complete Example 3.
6. Define **vertical asymptote**.
7. Complete Example 4.
8. Why is the fact that the limit is 1 convincing evidence that f and g behave alike for large absolute values of x in Example 6?
9. Define **end behavior model**.
10. Complete Example 7.
11. Complete Example 8.
12. Complete Example 9.

Section 2.3 Notes

1. What is a continuous function?
2. Complete Example 1.
3. Define **continuity at a point** (interior points and endpoints).
4. List and define the types of discontinuities.
5. Complete Exploration 1.
6. List the properties of continuous functions.
7. Write out what Theorem 7 means in your own words.
8. Complete Example 4.
9. Write out and explain the Intermediate Value Theorem in your own words.

Section 2.4 Notes

1. Define **average rate of change**.
2. Complete Example 1.
3. Complete Example 3.
4. Define the **slope of a curve at a point**.
5. Complete Example 4.
6. Define **normal line**.
7. Complete Example 5.

Attachment B

Section 2.1 Exercises

1. An object dropped from rest from the top of a tall building falls $y = 16t^2$ feet in the first t seconds. (NO CALCULATOR)
   a. Find the average speed during the first 4 seconds of fall.

   b. Find the speed of the object at t=4 seconds and confirm your answer algebraically.

2. Find the following limit: $\lim_{x \to c} \frac{x^4 - x^3 + 1}{x^2 + 9}$
   (NO CALCULATOR)

3. Determine the following limits by substitution: $\lim_{x \to -4} (x + 3)^{1998}$
   (NO CALCULATOR)

4. Explain why you cannot use substitution to determine the limit. Find the limit if it exists.
   (NO CALCULATOR)
   a. $\lim_{x \to 0} \frac{1}{x^2}$

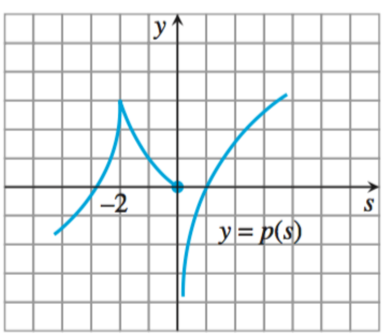
   b. $\lim_{x \to 0} \frac{(4 + x)^2 - 16}{x}$

5. Determine the limit graphically (CALCULATOR ACTIVE). Determine algebraically.

a. $\lim\limits_{x \to 0} \dfrac{\dfrac{1}{2+x} - \dfrac{1}{2}}{x}$

b. $\lim\limits_{x \to 0} \dfrac{x + \sin x}{x}$

6. Use the graphs to estimate the limits and values of each function, or explain why the limits do not exist. (NO CALCULATOR)

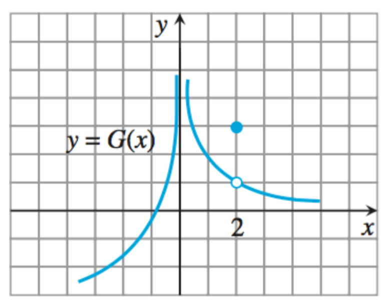


(a) $\lim\limits_{s \to -2^-} p(s)$

(b) $\lim\limits_{s \to -2^+} p(s)$

(c) $\lim\limits_{s \to -2} p(s)$

(d) $p(-2)$



(a) $\lim\limits_{x \to 2^-} G(x)$

(b) $\lim\limits_{x \to 2^+} G(x)$

(c) $\lim\limits_{x \to 2} G(x)$

(d) $G(2)$

Section 2.2 Exercises

1. Identify all horizontal asymptotes of the following functions. (NO CALCULATOR)

   a. $f(x) = \dfrac{\sin 2x}{x}$

   b. $f(x) = \dfrac{3x^3 - x + 1}{x + 3}$

   c. $f(x) = \dfrac{2x - 1}{|x| - 3}$

   d. $f(x) = \dfrac{|x|}{|x| + 1}$

2. Find the limit using the Sandwich Theorem. (NO CALCULATOR)

   a. $\lim\limits_{x \to -\infty} \dfrac{1 - \cos x}{x^2}$

   b. $\lim\limits_{x \to \infty} \dfrac{\sin(x^2)}{x}$

3. Find the vertical asymptote of each graph and describe the behavior to the left and right of each vertical asymptote. (NO CALCULATOR)

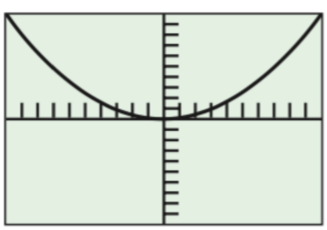
a. $f(x) = \dfrac{x^2 - 1}{2x + 4}$

b. $f(x) = \sec x$

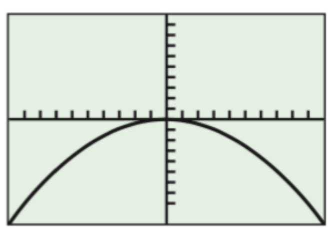
c. $f(x) = \dfrac{\cot x}{\cos x}$

4. Match the function with the graph of its end behavior model. (NO CALCULATOR)

$$y = \frac{x^4 - 3x^3 + x^2 - 1}{1 - x^2}$$



(a)



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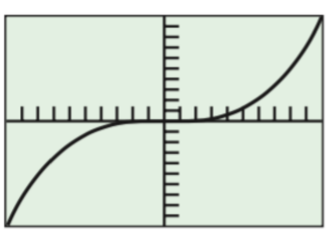
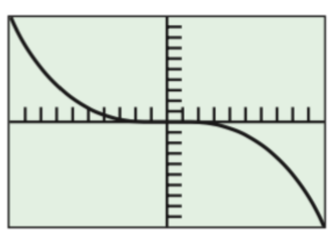


(c)



(d)

Section 2.3 Exercises

1. Find the points of continuity and the points of discontinuity of the function. Identify each type of discontinuity. (NO CALCULATOR)

a. $y = \dfrac{x+1}{x^2 - 4x + 3}$

b. $y = \cot x$

2. Use the function f defined and graphed below to answer the questions. (NO CALCULATOR)

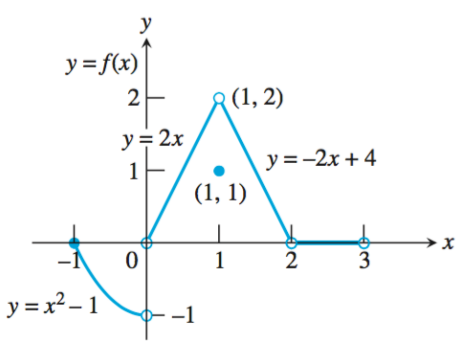
$$f(x) = \begin{cases} x^2 - 1, & -1 \le x < 0 \\ 2x, & 0 < x < 1 \\ 1, & x = 1 \\ -2x + 4, & 1 < x < 2 \\ 0, & 2 < x < 3 \end{cases}$$

(a) Does $f(1)$ exist?

(b) Does $\lim_{x\to 1} f(x)$ exist?

(c) Does $\lim_{x\to 1} f(x) = f(1)$?

(d) Is f continuous at $x = 1$?

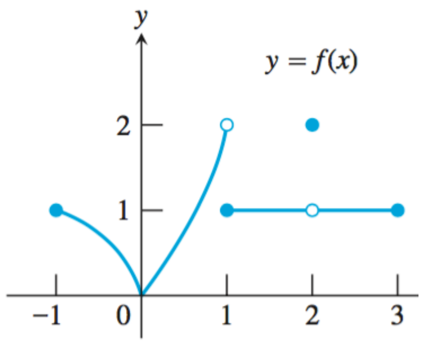


3. Find each point of discontinuity. Which of the discontinuities are removable? not removable? Give reason for your answers. (NO CALCULATOR)

a. $f(x) = \begin{cases} 3 - x, & x < 2 \\ 2, & x = 2 \\ x/2, & x > 2 \end{cases}$

b. $f(x) = \begin{cases} 1 - x^2, & x \neq -1 \\ 2, & x = -1 \end{cases}$

c.



4. Give a formula for the extended function that is continuous at the indicated point.

(NO CALCULATOR)

a. $f(x) = \dfrac{x - 4}{\sqrt{x} - 2}, \quad x = 4$

b. $f(x) = \dfrac{\sin 4x}{x}, \quad x = 0$

Section 2.4 Exercises

1. Find the average rate of change of the function over the interval. (NO CALCULATOR)

   a. $f(x) = \sqrt{4x + 1}$

      (a) $[0, 2]$ **(b)** $[10, 12]$

   b. $f(x) = \ln x$

      (a) $[1, 4]$ **(b)** $[100, 103]$

2. At the indicated point, find the slope of the curve, an equation of the tangent line, and an equation of the normal line.

   (NO CALCULATOR) $y = x^2 - 4x \quad \text{at} \quad x = 1$

3. Determine whether the curve has a tangent at the indicated point. If it does, give its slope. If not, explain why not. (NO CALCULATOR)

   a. $f(x) = \begin{cases} \sin x, & 0 \leq x < 3\pi/4 \\ \cos x, & 3\pi/4 \leq x \leq 2\pi \end{cases} \quad \text{at} \quad x = 3\pi/4$

   b. $f(x) = \begin{cases} -x, & x < 0 \\ x^2 - x, & x \geq 0 \end{cases} \quad \text{at} \quad x = 0$

4. Find the slope of the curve at x=a. Describe what happens to the tangent at x=a as a changes. (NO CALCULATOR)

   a. $y = 2/x$

   b. $y = 9 - x^2$