

# Arundel High School AP Calculus BC Summer Assignment

The attached summer packet is for all students enrolled in AP Calculus BC in the fall. Your summer assignment is a review of limits and continuity from Calculus AB. This packet will be collected on the first day of school. Show all work on separate paper. NO work written in the question packet will be checked.

This packet is due the first day back in school in the fall. It will be graded. You need to get off to a good start so spend some quality time on this packet this summer. Do not rely on the calculator. Use the calculator only on the problems where calculator use is indicated. Half of the AP exam next year is taken without a calculator.

It is a mistake to decide to do this now. Let it go until mid-summer. We want these techniques to be relatively fresh in your mind in the fall. Also, do not wait to do them at the very last minute. These take time.

If you have any questions about any of these problems or techniques used in solving in them, you may contact Ms. Hanna at [dhanna@aacps.org](mailto:dhanna@aacps.org). Have a great summer and see you in the fall!

*Have a great summer!*

## Summer Assignment for Calculus BC

1.  $\lim_{x \rightarrow 1} \frac{1 - \sqrt{x}}{x - 1} =$

2.  $\lim_{x \rightarrow 0} \left( \frac{1}{\sin x} - \frac{1}{x} \right) =$

3.  $\lim_{x \rightarrow 0^+} \left( \frac{1}{x} - \frac{1}{\sqrt{x}} \right) =$

4.  $\lim_{x \rightarrow \frac{\pi}{2}^-} \frac{\tan x + 3}{\tan^2 x} =$

5.  $\lim_{x \rightarrow -\infty} \frac{\sqrt{4x^2 - 1}}{7 - |x|} =$

6.  $\lim_{x \rightarrow a} \frac{\cos x - \cos a}{x - a} =$

7.  $\lim_{x \rightarrow \infty} x \sin \frac{1}{x} =$

8.  $\lim_{x \rightarrow -4} \frac{x^3 + 2x^2 - 8x}{x^2 + 4x} =$

9.  $\lim_{x \rightarrow 0^+} \frac{\ln x}{\ln x - 1} =$

10.  $\lim_{x \rightarrow 0} \frac{(2+x)^3 - 8}{x} =$

11.  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\ln(\sin x)}{\frac{\pi}{2} - x} =$

12.  $\lim_{x \rightarrow 0} \frac{x \csc x + 1}{x \csc x} =$

13.  $\lim_{t \rightarrow \infty} \frac{1000}{1 + 5e^{-0.2t}} =$

14. Which two functions grow at the same rate:  $5x^2$ ,  $2x^5$ ,  $\ln x^2$ ,  $\ln x$ ,  $e^{5x}$ ,  $e^{2x}$ , as  $x \rightarrow \infty$ ?

15. Find a value of  $k$  that makes  $f(x) = \begin{cases} x^2, & x \leq 1 \\ \sin(kx), & x > 1 \end{cases}$  continuous at  $x = 1$ .

16. If a function  $f$  is discontinuous at  $x = 4$ , which of the following must be true?

I.  $\lim_{x \rightarrow 4} f(x)$  does not exist

II.  $f(4)$  does not exist

III.  $\lim_{x \rightarrow 4^-} f(x) \neq \lim_{x \rightarrow 4^+} f(x)$

IV.  $\lim_{x \rightarrow 4} f(x) \neq f(4)$

17. Find all vertical and horizontal asymptotes for the graph of  $y = \frac{\ln x}{\ln x - 1}$ .

18.  $\lim_{x \rightarrow 0} \frac{2 \cos x - 2}{x}$  is equal to the derivative of what function at  $x = 0$ ?

19. If  $f(x) = \begin{cases} x^2 + 4, & x > 1 \\ 6 - x, & x \leq 1 \end{cases}$ , then  $\lim_{x \rightarrow 1} f(x) =$

20. If  $\lim_{x \rightarrow 3} f(x) = 7$  and  $\lim_{x \rightarrow 3} g(x) = 5$ , then  $\lim_{x \rightarrow 3} \frac{2(g(x))^2}{f(x) - 5} =$

21. For what values of  $k$  will  $\lim_{x \rightarrow 3} \frac{x - 3}{x^2 - 6x + k}$  exist?

22. For each part draw an example of a function that satisfies the conditions:

(a)  $f(3)$  exists, but  $\lim_{x \rightarrow 3} f(x)$  does not exist.

(b)  $\lim_{x \rightarrow 3} f(x)$  exists, but  $f(3)$  does not exist.

23. Find all horizontal and vertical asymptotes for  $f(x) = \frac{e^{-x}}{x}$ .

24. Find the points of discontinuity and identify the type of discontinuity for each function:

(a)  $y = e^{\frac{1}{x}}$

(b)  $y = \frac{x}{|x|}$

(c)  $y = \frac{x^2 - 5}{x - \sqrt{5}}$