Jefferson Township Public Schools

Summer Assignment for students entering AP Calculus BC

This assignment will count as a formative assessment and

is due on the second class meeting of the school year.

AP Calculus BC

Summer Packet 2026-2027

In order to complete the curriculum before the AP Exam in May, it is necessary to do some preparatory work this summer. The summer assignment, or review packet, helps you to focus on the mathematical skills and content you will need to use in solving Calculus problems. These problems deal with skills and content that you studied in Pre-Calculus.

* If a calculator has been used, then you must set up what you entered into the calculator and what the calculator produced for you on your paper.* **Try to only use a calculator when stated in the instructions. About 67% of the AP Exam does not allow use of a calculator. If decimal answers are given, round to the nearest thousandth (3 decimals)**

At this level, doing homework is more than just getting the problems done. The problems should be a learning experience. Take your time and make sure you understand the concepts behind each problem. Seek out help to deal with problems and concepts you find challenging. I recommend that you try to meet with other AP Calculus BC students in small groups this summer to help each other. We are all in this together!

If you don't know or remember how to do a problem, there are plenty of resources online, such as Khan Academy, Youtube and Purplemath. It is your responsibility to be prepared for the first day of class.

The AP Calculus BC curriculum is extensive considering it tests AB and BC material. Therefore, there are some pre-requisite topics you need to learn on your own over the summer. This helps us to focus on the calculus portion of these topics next year.

1. Find $f(x+\Delta x)\ for\ f(x)=x^2-2x-3.$

2. Find $\frac{f(x+\Delta x)-f(x)}{\Delta x}$ if $f(x)=8x^2+1$

3. Find $\frac{f(x+h)-f(x)}{h}$ if $f(x)=\frac{1}{x}$

4. Given $f(x)=x^2-3x+4$ find $f(x+2)-f(2)$

5. Simplify each expression completely.

(a) $\frac{\sqrt{x}}{x}$

(b) $e^{\ln 3}$

(c) $\ln 1$

(d) $\ln e^7$

(e) $\log_{1/2} 8$

(f) $e^{3\ln x}$

(g) $e^{ln4+ln7}$

(h) $\frac{x/2}{x/4}$

(i) $\frac{3x(x+1)-2(2x+1)}{(x-1)^2}$

(j) $\frac{\frac{1}{x}-\frac{1}{x+2}}{4x}$

(k) $\frac{\sqrt{x-2}+\frac{5}{\sqrt{x-2}}}{x-2}$

(l) $\frac{2x}{x-1}+\frac{4}{x^2-4x+3}$

6. Condense $\frac{1}{2}\ln(x-3)+\ln(x-6)-6\ln x$

7. Evaluate $\log_2 5$ to the nearest thousandth.

8. Solve for y′: $xy'+y=1+y'$

9. Let $f(x)=\begin{cases}3x+2, & x<2\\ -x^2, & x\geq 2\end{cases}$

(a) find $f(1)$ (b) find $f(5)$

10. Determine all points of intersection. Round to the nearest thousandth if necessary.

(a) $y=x^2+3x-4$
$y=5x+11$

(b) $y=x-1$
$y^2=2x+6$

(c) $y=x^3-2x^2+x-1$
$y=-x^2+3x-2$

11. For the functions below, give the zeros (if non exit, write none), domain, range, VA's, HA's, and/or points of discontinuity (holes-as ordered pairs) if any exist. Also sketch the functions graph.

(a) $f(x)=\frac{x+3}{2x^2+5x-3}$

(b) $f(x)=\frac{(x^2-3)(x+2)^2}{(x-3)(x+1)(4x^2+3)}$

Trigonometry

12. List the three Pythagorean identities

13. List the double angle formulas.

(a) $\sin 2x=$

(b) $\cos 2x=$

14. List the sum and difference formulas

(a) $\cos(\alpha \pm \beta) =$

(b) $\sin(\alpha \pm \beta) =$

15. List the power reducing formulas

(a) $\sin^2 x =$

(b) $\cos^2 x =$

Find the simplest exact value of each of the following.

16. $\sin\frac{7\pi}{6}$ _____

17. $\cos\left(-\frac{\pi}{3}\right)$ _____

18. $\tan\frac{4\pi}{3}$ _____

19. $\csc\frac{-5\pi}{4}$ _____

20. $\sec\frac{5\pi}{6}$ _____

21. $\cot\frac{2\pi}{3}$ _____

22. $\sin^{-1}.5$ _____

23. $\sec^{-1} 2$ _____

24. $\cos^{-1}\frac{-\sqrt{3}}{2}$ _____

25. Simplify

(a) $\sin^2 x + \cot^2 x \sin^2 x$

(b) $\csc x - \cos^2 x \csc x$

(c) $\frac{\sin^2 x+\sin x-6}{\sin x+3}$

26. Find the solution of the equations for $0 \leq x \leq 2\pi$

(a) $2\sin^2 x = 1 - \sin\theta$

(b) $2\tan\theta - \sec^2\theta = 0$

(c) $\sin 2\theta + \sin \theta = 0$

Limits

27. Find the limits, if they exist.

(a) $\lim_{x \to 4} \frac{2x^3 - 7x^2 - 4x}{x - 4}$

(b) $\lim_{x \to 9} \frac{\sqrt{x} - 3}{9 - x}$

(c) $\lim_{x \to 1} \frac{x^2 - 2x - 5}{x + 1}$

(d) $\lim_{x \to 2} \frac{x^3 + 8}{x + 2}$

(e) $\lim_{x \to -2} \frac{x - 4}{x^2 - 2x - 8}$

(f) $\lim_{x \to 5} \frac{x - 5}{|x - 5|}$

(g) $\lim_{x \to 1} \frac{x - 1}{x^2 - 1}$

(h) $\lim_{x \to 5} 2x^2 - 3x + 4$

(i) $\lim_{x \to -2} \frac{x^3 + 2x^2 - 1}{5 - 3x}$

(j) $\lim_{x\to -3} \frac{x^2+x-6}{x^2-9}$

(k) $\lim_{x\to 25} \frac{\sqrt{x}-5}{x-25}$

(l) $\lim_{t\to \infty} \frac{6t^2+5t}{(1-t)(2t-3)}$

(m) $\lim_{x\to \infty} \cos x$

(n) $\lim_{x\to 0} \frac{\sqrt{x+4}-2}{x}$

(o) $\lim_{x\to \infty} \frac{2x^2}{5x^2-9x-2}$

(p) $\lim_{x\to \infty} \frac{x^2+x}{3-x}$

(q) $\lim_{x\to -2} \frac{x^3+8}{x+2}$

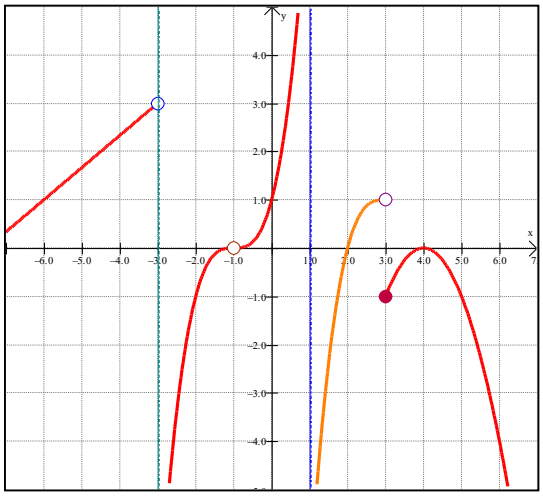
28. Explain why each function is discontinuous and determine if the discontinuity is removable or non-removable.

(a) $g(x) = \begin{cases} 2x-3, & x<3 \\ -x+5, & x\geq 3 \end{cases}$

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

(c) $h(x) = \frac{\sqrt{x^2-10x+25}}{x-5}$

29. Determine if the following limits exist, based on the graph below of p(x). If the limits exist, state their value. Note that x= -3 and x=1 are vertical asymptotes.



(a) $\lim_{x\to 1^-} p(x)$

(b) $\lim_{x\to -3^-} p(x)$

(c) $\lim_{x\to 2} p(x)$

(d) $\lim_{x\to 3^-} p(x)$

(e) $\lim_{x\to 3^+} p(x)$

(f) $\lim_{x\to -1} p(x)$

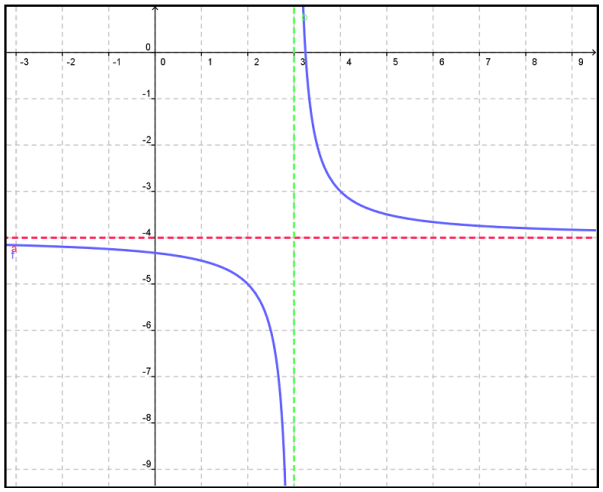
For #30-32 each of the following determine: a) $\lim_{x\to 1^-} f(x)$ b) $\lim_{x\to 1^+} f(x)$ c) $\lim_{x\to 1} f(x)$

30. $f(x) = \begin{cases} x^2 - 1, & x < 1 \\ 4 - x, & x \geq 1 \end{cases}$

31. $f(x) = \begin{cases} 3x - 1, & x \leq 1 \\ 3 - x, & x > 1 \end{cases}$

32. $f(x) = \begin{cases} -x^2, & x < 1 \\ 2, & x = 1 \\ x - 2, & x > 1 \end{cases}$

33. Use the graph of $f(x)$, shown below, to answer the following questions.

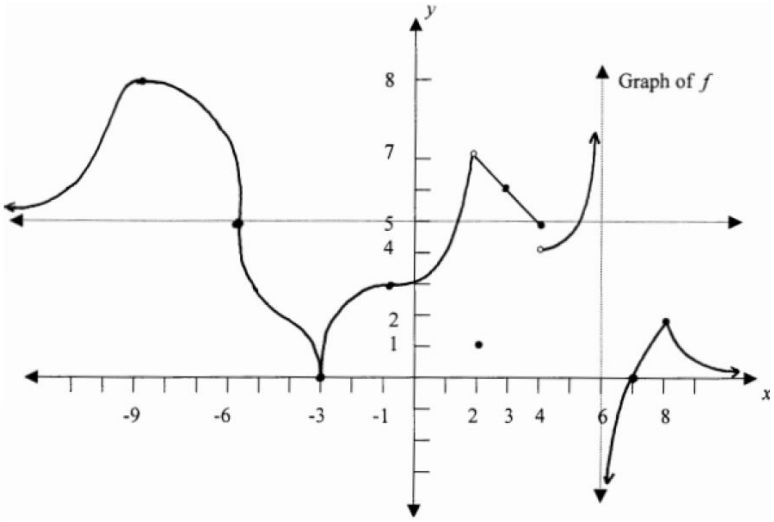


(a) For what value of a is $\lim_{x\to a} f(x)$ nonexistent?

(b) $\lim_{x\to \infty} f(x)$

(c) $\lim_{x\to -\infty} f(x)$

34. Use the graph below for the following questions.



(a) $\lim_{x\to 3^-} f(x)$ (b) $\lim_{x\to 4^+} f(x)$ (c) $\lim_{x\to 3^+} f(x)$

(d) $\lim_{x\to 4} f(x)$ (e) $\lim_{x\to -3} f(x)$ (f) $\lim_{x\to 6^-} f(x)$

(g) $\lim_{x\to -6^+} f(x)$ (h) $\lim_{x\to 2^-} f(x)$ (i) $\lim_{x\to 6} f(x)$

(j) $\lim_{x\to 2^+} f(x)$ (k) $\lim_{x\to 2} f(x)$ (l) $\lim_{x\to -\infty} f(x)$

(m) $\lim_{x\to 4^-} f(x)$ (n) $\lim_{x\to \infty} f(x)$ (o) $f(2)$

(p) $f(3)$

35. Consider the function $(x) = \begin{cases} x^2 + kx, & x \le 5 \\ 5\,sin\left(\frac{\pi}{2}x\right), & x > 5 \end{cases}$. In order for the function to be continuous at x = 5, find the value of k.

36. Consider the function $f(x) = \begin{cases} \frac{sin\,x}{x}, & x \neq 0 \\ k, & x = 0 \end{cases}$. In order for the function to be continuous at x = 0, find the value of k.