To: 2019-2020 AP Calculus AB Students

From: Mr. Kong and Mr. Evans (the Calculus teachers)

Re: AP Calculus Summer Review Packet

Welcome to AP Calculus AB! To be successful in this course, you must possess strong algebra and trigonometry skills. We recommend reviewing and practicing these skills over the summer. This packet reviews many of the most important topics that are needed for Calculus, including how to make best use of your graphing calculator. Although we are aware that Desmos and other online calculators are free and easy to use, it is important that you know how to use a graphing calculator, because that is what you will use on our tests and the AP exam. We have included links to video tutorials in case you need the additional assistance. Although this packet is not a required assignment, we highly recommend you complete it over the summer to best prepare for next year.

You must also study your unit circle. You should be able to provide the sine, cosine, and tangent values for every common angle on the unit circle. As opposed to filling out an entire unit circle by memory, it will be very important in AP Calculus that you can quickly come up with a single value from the unit circle whenever asked. (For Example: What is $\sin\frac{5\pi}{4}$?) You will need this knowledge for Calculus, and it will not be retaught.

If you do not already have a graphing calculator, you will need to get one over the summer – bring it with you on the first day of class. Although a TI-83+ is acceptable, we highly recommend a TI-84 if you are purchasing a new one. The TI-84 has nice short cuts that will make your life in Calculus easier. If it is not possible for you to obtain a graphing calculator on your own, then we can make arrangements for you to borrow one once the school year begins.

If you have any questions while completing the packet, please email one of us at:

eumin_kong@beaverton.k12.or.us   or   chris_evans@beaverton.k12.or.us

We look forward to working with all of you next school year. Enjoy your summer!

Graphs of Common Functions

In AP Calculus, you won't be asked to sketch graphs by hand very often, but it is very helpful to have a basic understanding of what the graphs of common functions look like. Match the following graphs with their equations.

1)

2)

3)

4)

5)

6)

7)

8)

9)

10)

11)

12)

(A) $y = x^3$ (B) $y = \frac{1}{x}$ (C) $y = 3$
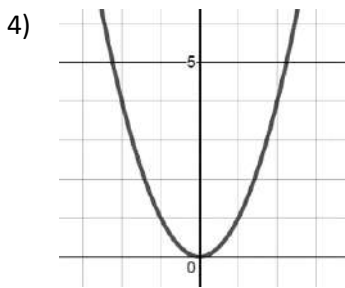
13)

14)
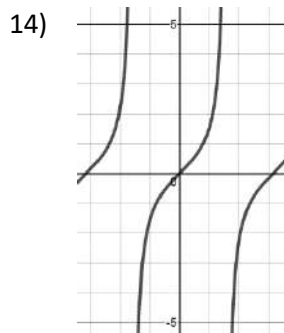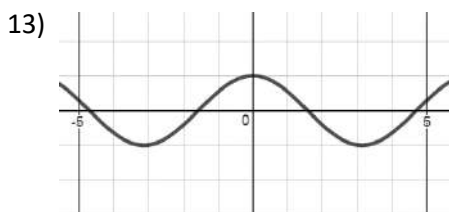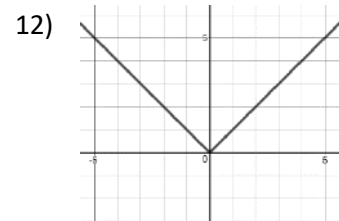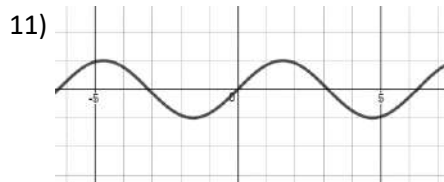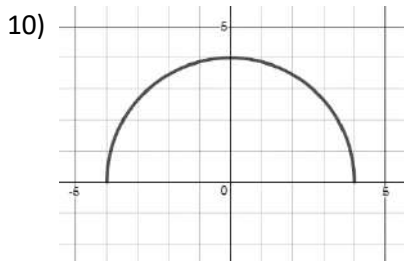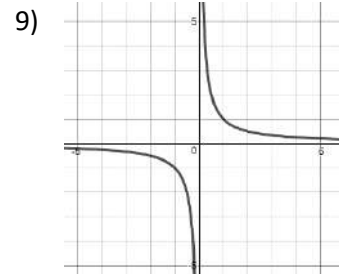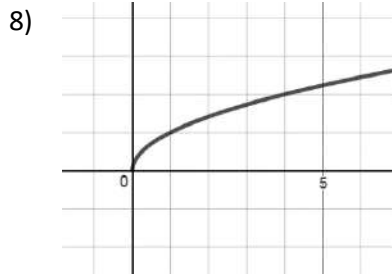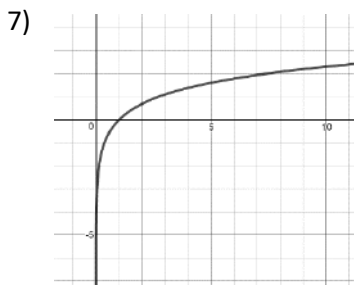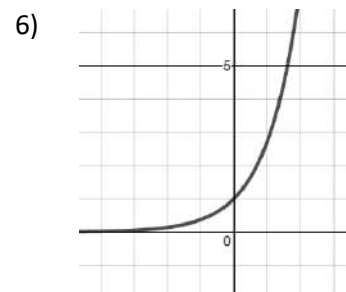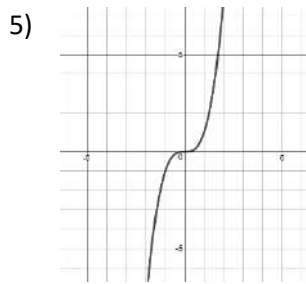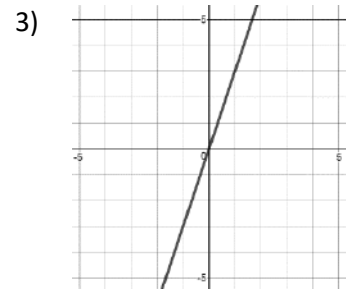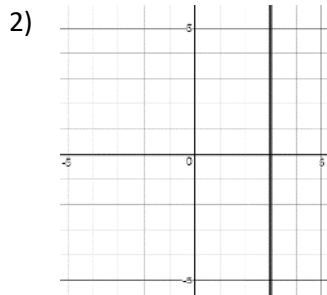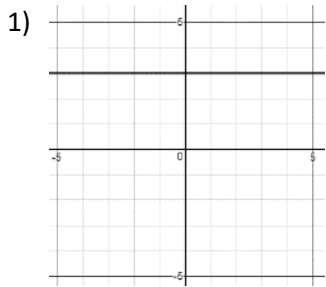
(D) $y = e^x$ (E) $y = 3x$ (F) $y = \cos x$

(G) $y = \sqrt{x}$ (H) $y = \ln x$ (I) $x = 3$

(J) $y = \tan x$ (K) $y = x^2$ (L) $y = \sin x$

(M) $y = \sqrt{16 - x^2}$ (N) $y = |x|$

Solving Equations by Factoring (non-calculator)   Link: https://tinyurl.com/hsdp6l9

Solve each equation below by factoring.

15) $7x^2 - 3x = 0$

16) $x^2 - 5x + 6 = 0$

17) $2x^2 + 4x = 48$

18) $9x^2 - 25 = 0$

19) $2x^2 + 7x - 4 = 0$

20) $26x + 16 = -3x^2$

21) $3(x - 2) + x(x - 2) = 0$

22) $x(x - 1)^2 + 14(x - 1)^3 = 0$

23) $3e^x - 4xe^x = 0$

Asymptotes and Holes (non-calculator)   Link: https://tinyurl.com/zr2epbz

For each function below, determine the location of any vertical asymptotes, horizontal asymptotes, and holes (if any exist).

24) $y = \frac{2x+1}{x-3}$

25) $f(x) = \frac{x^2-9}{4x^2+8x-12}$

26) $g(x) = \frac{3x^4}{x^3-3x^2-10x}$

27) $y = \frac{7x+8}{x^2+4}$

Exponential and Logarithmic Equations   Links: https://tinyurl.com/y8crcv9x and https://tinyurl.com/yae8tdg9

Solve each exponential and logarithmic equation below. For each problem, provide both the exact answer obtained without a calculator as well as a decimal approximation rounded to three decimal places (when applicable).

28) $3^{-5x} = 81$

29) $4e^x = 18$

30) $e^{2x} = e^8 - 5$

31) $\frac{16e^x}{3e^x+6} = 2$

32) $\log_4 x = 2$

33) $\ln x = -2$

34) $\ln e^{3x} + 5 = 14$

35) $\ln x + \ln(x - 2) = \ln 35$

Compositions of Functions   Link: https://tinyurl.com/zksrrov

For each function below, evaluate $f(9)$, $f(x^2)$, and $f(x + h)$.

36) $f(x) = 3x - 1$

37) $f(x) = x^2 + 4x + 5$

38) $f(x) = \frac{4}{\sqrt{x}-x}$ for $x > 0$

Trigonometric Expressions and Equations (non-calculator)   Link:
Use your knowledge of the unit circle to find the exact value of each trigonometric expression (if it exists).

39) $\sin \frac{\pi}{2}$

40) $\cos\left(-\frac{\pi}{3}\right)$

41) $\tan \frac{3\pi}{4}$

42) $\sec \frac{7\pi}{6}$

43) $\csc \frac{5\pi}{6}$

44) $\cot \frac{2\pi}{3}$

45) $3 \sin^2 \frac{9\pi}{4}$

46) $8 \tan \frac{3\pi}{2}$

47) $\sin \frac{5\pi}{3} - \cos^3 \frac{4\pi}{3}$

Solve each trigonometric equation below on the interval $[0, 2\pi]$. All answers should be in radians and obtained without a calculator.   Link:

48) $\sin x = \frac{1}{2}$

49) $2 \cos x + \sqrt{3} = 0$

50) $\sin^2 x = 1$

51) $\cos^2 x - \cos x = 0$

52) $4 \tan x + 4 = 0$

53) $\sin(2x) = \frac{\sqrt{2}}{2}$

Graphing Calculators (All answers should be rounded to 3 decimal places.)   Link:
Use your graphing calculator to find all of the x-intercepts (zeros) of each function.

54) $f(x) = 8x^2 - 3x - 7$

55) $y = 6e^{2x} + 8x$

56) $h(x) = \frac{x}{5} + \cos x$

Use your graphing calculator to find the coordinates of all relative maximums and relative minimums for each function.
Then list the intervals on which the function is increasing and decreasing.   Link:

57) $g(x) = \frac{1}{3}x^3 - 3.5x^2 + 10x + 2$

58) $y = \sin^2(x - 1) + 3$ on the interval [0, 5]

Use your graphing calculator to find the coordinates of all points of intersection for the given pair of functions.
        Link:

59) $f(x) = -x^2 - 5x + 4$
    $g(x) = x - 2$

60) $y_1 = 5\cos\left(\frac{x}{2}\right)$
    $y_2 = (x - 1)^2 + 2$

Solve each equation below by graphing both sides of the equation in your graphing calculator and locating the point(s) of intersection.

61) $x^{2/3} = e^{2x} - 3$

62) $(x - 3)^4 = \frac{3x}{2} + \ln x$