AP Calculus AB Summer Packet (Pre-Chapter 2 Homework)

Dear Student,

You are about to begin the exciting journey of learning calculus. Calculus is considered the pinnacle of mathematics and it is directly responsible for almost every modern convenience that you have in your life. This packet is designed to bring you up to speed on the various concepts of Algebra II and Trigonometry that are needed for Chapter 2 of our book. Chapter 2 is where we will begin the class.

As for calculators, you will check out a TI-89 Titanium from the school library at the beginning of the school year. The TI-89 Titanium is the only calculator that I fully support. If you choose to use another calculator then you will have to figure out some things by yourself. The following link is the AP approved calculator list at AP Central. (http://www.collegeboard.com/student/testing/ap/calculus_ab/calc.html).

Feel free to email me at David_Robinson.k12.ca.us during the summer if you have any questions. Please do the following problems, re-learn what you have forgotten, and be prepared to turn it in at registration. If you get stuck on any topics then I suggest looking up the problem (or topic) on the internet. There are many great tutorial websites. My absolute favorite math tutor is PatrickJMT (Go to patrickjmt.com or YouTube).

Sincerely,

Mr. Robinson

Algebra II – Parent Graphs

Stuff to Remember:
$-f(x)$ is $f(x)$ reflected over the x-axis
$f(-x)$ is $f(x)$ reflected over the y-axis
$f(x+c)$ is $f(x)$ translated -c units horizontally
$f(x)+c$ is $f(x)$ translated c units vertically
$|f(x)|$ is $f(x)$ with the negative y-values reflected over the x-axis
$f(|x|)$ is $f(x)$ with the positive x-values reflected over the y-axis

There are many parent graphs that you should know well and they are listed in the problems below. You should be able to **sketch** each of them quickly and accurately. In calculus, we analyze and use graphs often. You are expected to graph these problems without a calculator. **Graph the following problems:**

1. $y = x$
2. $y = x^2$
3. $y = x^3$
4. $y = |x|$
5. $y = \sqrt{x}$
6. $y = \sqrt[3]{x}$
7. $y = \dfrac{1}{x}$
8. $y = \dfrac{1}{x^2}$
9. $3x + 2y = 5$
10. $y - 5 = \frac{1}{2}(x+1)^2$
11. $y = (x-2)^3$
12. $y = -2|x| - 3$
13. $y = 5\sqrt{x-1}$
14. $y = \left|\sqrt{x} - 2\right|$
15. $y = \sqrt[3]{x} + 4$
16. $y = \dfrac{1}{3x}$
17. $y = -\dfrac{1}{(x-2)^2}$
18. $y = -3$
19. $x = 2$
20. $y = \sin x$
21. $y = \cos x$
22. $y = \tan x$
23. $y = \cot x$
24. $y = \sec x$
25. $y = \csc x$
26. $y = \ln x$
27. $y = e^x$
28. $y = e^{-x}$

This graph is not a parent graph, but it comes up really often in Calculus (Google this graph):

15. $y = \sqrt{9 - x^2}$

Algebra II – Factoring

Factoring the Difference or Sum of Two Cubes

$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

Factor the following problems:

16. $(x^3 + 125)$
17. $(8x^3 - 27)$

Trigonometry – Basic Stuff

In Calculus, all angle measures and problems using trigonometry will be expressed in radians.

Triangle Trig: cos (x) = adjacent over hypotenuse
sin (x) = opposite over hypotenuse
tan (x) = opposite over adjacent

Identities:

Definitions

$\tan x = \dfrac{\sin x}{\cos x}$

$\cot x = \dfrac{\cos x}{\sin x}$

Reciprocals

$\sin x = \dfrac{1}{\csc x}$ $\quad \cot x = \dfrac{1}{\tan x}$

$\cos x = \dfrac{1}{\sec x}$ $\quad \sec x = \dfrac{1}{\cos x}$

$\tan x = \dfrac{1}{\cot x}$ $\quad \csc x = \dfrac{1}{\sin x}$

Pythagorean

$\sin^2 x + \cos^2 x = 1$

$\tan^2 x + 1 = \sec^2 x$

$1 + \cot^2 x = \csc^2 x$

Unit Circle:

- know all the radian values of all the major angles
- know all the x- and y- coordinates of all the major angles
- know that the x-coordinate is cosine and the y-coordinate is sine

We will have a quiz on the unit circle on the 2nd day of school. Be prepared!

Do the following problems:

18. Draw the complete unit circle from memory.
19. Write all six trigonometric functions for $\theta = \dfrac{\pi}{6}$.
20. Write all six trigonometric functions for $\theta = \dfrac{\pi}{2}$.
21. Write all six trigonometric functions for $\theta = \dfrac{5\pi}{4}$.
22. Graph two periods of $2\cos 3\theta$.
23. Graph two periods of $\sin \dfrac{\pi x}{2}$.

Algebra II – Simplifying

Random simplifying that you will need to be able to do in Chapter 2. If you do the algebra then the "*h*" should eventually cancel out. **Simplify the following problems:**

24. $\dfrac{\left[4(x+h)+3\right]-\left[4x+3\right]}{h}=$

25. $\dfrac{\left[(x+h)^2+5(x+h)-1\right]-\left[x^2+5x-1\right]}{h}=$

26. $\dfrac{\left[\dfrac{1}{x+h+7}\right]-\left[\dfrac{1}{x+7}\right]}{h}=$

All finished! Have a great summer and I look forward to meeting you soon!

If you are **WAY** into this, then I recommend you continue and review a few more problems. These problems are optional (not required) but they are very important to calculus.

Algebra II – Inverse, Composite, Exponential Equations, Log Equations:

More (optional) topics that you will need to remember from Algebra 2:

1. Find the inverse function: If $f(x)=\dfrac{3}{x+2}$, then find $f^{-1}(x)$
2. Composite functions: If $f(x)=\dfrac{1}{x^2-1}$ and $g(x)=\sqrt{x}$, find $(f\circ g)(x)$ and $(g\circ f)(x)$
3. Exponents and logarithms: Solve $4^{x-2}=3$
4. Exponents and Logarithms: Solve $3e^{4x}+2=26$
5. Exponents and Logarithms: Solve $\ln 5-\ln(2x+1)=4$