AP Calculus Summer Packet

There are certain skills that have been taught to you over the past few years that are essential towards your success in AP Calculus AB/BC. If you do not have these skills, you will find that you will consistently get problems incorrect even if you understand the calculus concepts. It is frustrating for students when they make algebraic or careless mistakes, yet get the calculus aspect of the problem. The purpose of this summer packet is to shake off the rust and review these topics.

Don't fake your way through these problems because you will need to understand everything in this very well. Also, don't wait until the last minute to do everything in the packet because you may run out of time or realize that there are concepts you don't understand. Likewise, do not do all the problems right at the beginning of the summer and forget how to do all of them by the time school starts again. You should complete this throughout the summer, doing a few problems each day, like a daily journal. I encourage you to work through this with other students or students that were in AP Calculus in previous years.

Although this summer packet will not be graded, you will have a quiz and a test after the first few days of school that covers all of the topics in this packet. We will go through every topic in class, but we will not go over every single question so do not depend on the in-class review to learn everything. The review should be time to practice things you've relearned (or learned) over the summer. For this packet, you should show all work to help you understand any errors or misunderstandings (if any). It is also very important to complete this packet **without the use of a calculator** (unless otherwise noted). Two-thirds of the AP exam is non-calculator, so it is important to get used to doing mathematics without a calculator.

Below you will find excerpts from letters that last year's students wrote in regards to their thoughts and feelings about this summer packet. We will be reading these letters on a monthly basis throughout the course to get a student's perspective on how to be successful in AP Calculus AB/BC.

"The first few weeks of the course, I was worried that I wasn't prepared for it and didn't have the capacity for this class. The summer packet made me feel more prepared for it. It is really important to do, it gives you a preview of the class. Also, by completing your summer packet, you don't forget what you did in pre calculus. If you think the summer packet and the first test were hard, don't be scared to switch to Calculus AB. It's better to feel comfortable in a class than feel like all the units are rushed."

"The first thing I would say is most important for the class is to do the summer packet, as it covers a lot of things you might've forgotten from pre-calc. It isn't a ton of work and definitely helps for the first week or two of class."

If you have any questions, please email any of us at Michael.Gough@fcps.org or Michelle.Bluman@fcps.org . I will get back to you as quickly as I can. I look forward to working with you over the next year!

Mr. Gough, Ms. Bluman

A. Factor and simplify completely

1) $\dfrac{x^2+x-12}{2x^3-16x^2+30x}$

2) $\dfrac{x^3-64}{x^2-16}$

3) $2x^2-13x-15$

4) t^4-13t^2+36

5) $x^{\frac{5}{2}}-5x^{\frac{3}{2}}-6x^{\frac{1}{2}}$

6) $(x-3)^2(2x+1)^3+(x-3)^3(2x+1)^2$

B. Simplify each expression in order to obtain a single fraction. Show all work.

1) $\dfrac{1}{x+h}-\dfrac{1}{x}$

2) $\dfrac{\dfrac{4}{x+1}}{1-\dfrac{2}{x}}$

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

C. If $f(x)=1-x^2$, $g(x)=2x+1$ and $m(x)=\begin{cases}\sqrt{5-4x} & , \ x<3 \\ |x-7| & , \ x\geq 3\end{cases}$, find:

1) $f(3)$

2) $g(-2)$

3) $m(-11)$

4) $g\left(f(0)\right)$

5) $f\left(m(5)\right)$

6) $m\left(m(-1)\right)$

7) $f(x+h)$

8) $f(g(a))$

9) $m\left(t^2+4\right)$

10) $g(x)-f(x)$

11) $f(t)g(t)$

12) $\dfrac{g(x+h)-g(x)}{h}$

D. Using point-slope form $y-y_1=m\left(x-x_1\right)$, write an equation for the line…

1) containing the points (1, -3) and (-5, 2)

2) perpendicular to the line in #1, containing the point (3, 4)

E. Identify the mistakes in each of the following mathematical statements.

1) $(3x+4)^2 = 9x^2 + 16$

2) $3x^{-2} = \dfrac{1}{3x^2}$

3) $\sqrt{x^2+9} = x+3$

4) $\dfrac{x^2+15x}{x+2} = \dfrac{x+15}{2}$

F. Determine the exact value of each expression. Remember NO CALCULATORS!

1) $\sin 0 =$ _____

2) $\cos\pi =$ _____

3) $\tan 2\pi =$ _____

4) $\sin\dfrac{3\pi}{4} =$ _____

5) $\cos\dfrac{7\pi}{6} =$ _____

6) $\tan\dfrac{\pi}{3} =$ _____

7) $\sec\dfrac{3\pi}{2} =$ _____

8) $\csc\dfrac{2\pi}{3} =$ _____

9) $\cot\dfrac{11\pi}{6} =$ _____

10) $\sin\dfrac{-\pi}{6} =$ _____

11) $\tan\dfrac{-\pi}{2} =$ _____

12) $\arcsin\dfrac{\sqrt{3}}{2} =$ _____

13) $\tan^{-1}(-1) =$ _____

14) $\arccos 0 =$ _____

15) $\arcsin\left(-\dfrac{1}{2}\right) =$ _____

16) $e^{\ln 4} =$ _____

17) $\ln 1 =$ _____

18) $\ln\sqrt{e} =$ _____

G. Simplify the following using identities.

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

2) $2 + 2\tan^2 x =$ _____

3) $\sin\left(\arccos\left(\frac{1}{2}\right)\right) =$ _____

4) $\tan\left(\arcsin\left(\frac{x}{3}\right)\right) =$ _____

H. For each of the following, sketch the function and then determine its domain and range.

1) $y = \sqrt{x+4}$

2) $y = |x-2| - 3$

3) $y = 4\cos x$

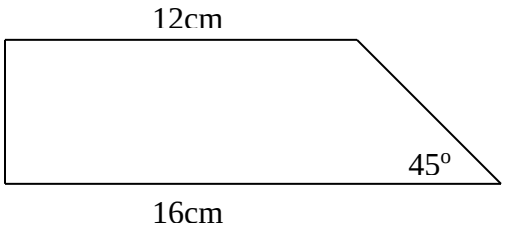
4) $y = 2 + e^x$

5) $y = \frac{1}{x+1}$

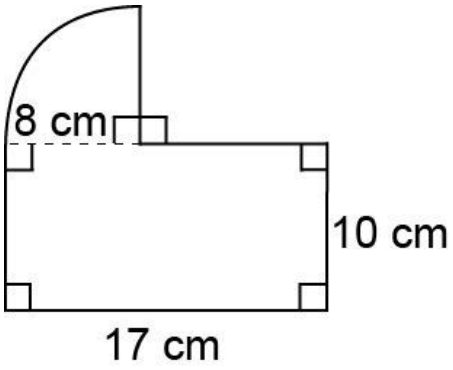
6) $y = \ln(x-2)$

I. Geometry

1) Find the area of the right trapezoid below.



2) Find the perimeter of the figure below



J. Solve each inequality, expressing the solution in interval notation.

1) $x^2 - 5x \geq 14$

2) $(x+3)(x-1)^2 < 0$

K. Solve the equation for x, where x is a real number.

1) $x^2 + 3x - 4 = 14$

2) $\frac{x^4 - 1}{x^3} = 0$

3) $\sqrt{x-1} - \frac{5}{\sqrt{x-1}} = 0$

4) $2x^2 + 5x = 8$

5) $\frac{20}{e^{2x} + 1} = 2$

6) $5\ln(2x+1) - 3 = 6$

Solve each equation on the interval $[0,2\pi)$.

7) $\sin x + 1 = 0$

8) $2\tan x \cos x - \tan x = 0$

9) $4\sin^2 x - 1 = 0$

10) $\tan 2x = 1$

Solve for z.

11) $3xz = -10yz + 19$

12) $h = \sqrt[3]{\dfrac{2x^4}{z}}$

L. The number of elk after t , given $0 \le t \le 300$ and t is measured in months, in a state park is modeled by the function $P(t) = \dfrac{1216}{1+73e^{-0.04t}}$. **You may use a calculator for this problem.**

1) What was the initial population?

2) When will the number of elk be 750?

3) What is the maximum number of elk possible in the park?

4) The number of prairie dogs in the same state park can be modeled by the function $D(t) = 694 + 317\cos\left(\dfrac{161}{t+1}\right)$. After how many months will the population of elk be the same as the prairie dog population?