Calculus II Summer Assignment

Hi folks. The purpose of this packet is to provide you with fodder to shake off some of the rust and get back to thinking about Calculus. Do us both the favor of NOT looking at these problems too much prior to the middle of August. In all honesty, there will need to be some review at the beginning of this course, since a lot of what you did last year in AP Calculus will carry over, but the closer to September, the better.

To call the questions included in the packet "pre-requisite" for students entering this course doesn't really explain the packet best. Consider it a "sampling of things I would like you to remember from last year." While there may be some questions that present a struggle, please feel free to get assistance from a textbook or from an individual that can help, but *only after you have attempted the problem on your own to the best of your abilities*. Do not worry too much if there are a couple of questions that give you problems. Do your best and work hard.

I will be collecting the packet on the second day of class in September (Wed., September 7th). Please show all work and answers on the packet itself, and include any additional paper on which you may have done additional work.

I know this first part is Pre-calculus, but you'd be amazed at how much trigonometry we are going to use this year. Not immediately, but in spurts, for sure.

1.) Please give the value of each expression without the use of a calculator:

a.) $\sin\left(\cos^{-1}\frac{1}{4}\right)$

b.) $\cos\left(\tan^{-1}(-2)\right)$

c.) $\cos\left(2\sin^{-1}\frac{1}{5}\right)$

d.) $\cos\left(\tan^{-1}\frac{5}{12}-\cot^{-1}\frac{4}{3}\right)$

2.) Please write each of the following as an expression in x:

a.) $\tan(\sin^{-1}x)$

b.) $\tan\left(\cos^{-1}\frac{3}{x}\right)$

Okay, enough of the trigonometry. On to the Calculus reminders:

3.) Please design two functions, $f(x)$ and $g(x)$ such that $f(x)+g(x)=4x^2+3x+1$ and $\lim_{x\to\infty}\frac{f(x)}{g(x)}=3$

4.) What are the equations of the horizontal and vertical asymptotes of $f(x)=\frac{3a^2x^2+2abx-b^2}{6a^2x^2-abx-b^2}$, where $a,b\in\mathbb{R}$

5.) What is the equation of the line tangent to $h(x)=2x^3-3x+5$ at the point $(1,4)$?

6.) Please determine the functions that have the following derivatives:

a.) $2\sec x\tan x$ b.) $-\frac{1}{x}$ c.) e^{2x} d.) $\frac{1}{x^2+1}$ e.) $\csc^2 x$

7.) Please find the derivative of each of the following:

a.) $f(x) = \sqrt{\sin x}$ b.) $g(x) = x\tan(4x)$ c.) $\ln(x^2 + 4)$

8.) Please find $\frac{dy}{dx}$, given each of the following equations:

a.) $e^{y^2} + 3y = \tan x$ b.) $2x^3 + 3y^4 = \cos x$

9.) Please find $\frac{d^2y}{dx^2}$ if $x^2 - y^2 = 16$

10.) If a particle moves along the *x*-axis according to the position function $s(t) = t^4 - 4t^2 + 3$, for $t \geq 0$, where *s* is measured in feet and *t* in seconds,

a.) What is the particle's velocity and acceleration when $t = 3$?

b.) When is the particle moving to the right?

11.) *As you probably remember, there were a SLEW of other topics covered in Calculus I – Newton's Method, Related rates, Optimization, Second Fundamental Theorem of Calculus, Derivatives of Inverse Functions, etc. – too much to mention here. A lot of these topics will <u>not</u> rear their collective heads again, believe it or not, until we begin looking at the AP Calculus Examination. That is, the topics are exclusively "Calculus I" topics. Other topics will be encountered intermittently during the year, and we will have a "brief review" when the time comes. So . . . I won't ask any of those topics here.*

BUT . . . The topic that we will encounter <u>immediately</u> is "methods of integration." Up to this point, we have only integrated "basic functions" and functions involving u-substitution. That is all you will need to address these integrals. Knowledge of basic forms of integrals will be essential as the year begins, so try to nail all of these down.

a.) $\int \frac{x^5 + 2x^2 - 1}{x^4} dx$

b.) $\int (1 + \sin^2\theta \csc\theta) d\theta$

c.) $\int \frac{\sin 2x}{\cos x} dx$

d.) $\int x^{1/3}(2-x)^2 dx$

e.) $\int \cos x \sin^5 x dx$

f.) $\int \frac{\sin \sqrt{x}}{\sqrt{x}} dx$

g.) $\int \frac{3x}{\sqrt{4x^2+5}} dx$

h.) $\int \frac{y}{\sqrt{y+1}} dy$

i.) $\int_4^9 2x\sqrt{x} dx$

j.) $\int_0^3 2x(x^2+6)^5 dx$

k.) $\int_1^5 |x-2|\,dx$

l.) $\int \tan x dx$

m.) $\int \frac{5x^4}{x^5+1} dx$

n.) $\int \cos x \cdot e^{\sin x} dx$

o.) $\int x^2 e^{-2x^3} dx$

p.) $\int_0^{\ln 2} e^{-3x} dx$

q.) $\int \frac{x}{x+1} dx$

r.) $\int \frac{3}{x^2+4} dx$