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AP Calculus BC Summer Assignment 2016

Name:_____HR_____

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Welcome to AP Calculus BC!!! As you enter calculus, it is expected that you have mastered the content in the courses from Algebra to AP Calculus AB as this is important to your success in calculus. When you come across a topic that requires a little more review, feel free to search a website, call a friend or email me your questions. Relevant websites can be found at:

- ***http://patrickjmt.com/***
- ***http://www.khanacademy.org***
- ***www.mastermathmentor.com***

✓ ***You must do each of the problems without a calculator, showing ALL steps which lead to the solution in an organized manner.***

✓ ***Show all work on every problem to receive credit on notebook paper. Circle all answers.***

✓ ***All work must be done in pencil (No pens).***

For the first day of class, you will need either a three-subject notebook or a two inch binder with paper strictly for calculus. Also get yourself a folder for handouts. Calculus is a fast paced and challenging course. It is extremely important to be organized and always prepared for class.

This packet is due the first day of school. The content contained in this packet is pre-requisite knowledge for AP Calculus BC. There will be a test within the first week back to school.

- Memorize the trigonometric functions of the basic angles. Learn the "Hand Trick!"
- Make sure you can recognize the graphs of all parent functions.

Enjoy your summer. If you have question you can email me at **ramoortiz@paps.net**

Looking forward to seeing you in September!

Mr. Ortiz

Memorize these Trigonometric Identities!!!

RECIPROCAL IDENTITIES

$$\csc\theta = \frac{1}{\sin\theta}$$

$$\sec\theta = \frac{1}{\cos\theta}$$

$$\cot\theta = \frac{1}{\tan\theta}$$

RATIO IDENTITIES

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

$$\cot\theta = \frac{\cos\theta}{\sin\theta}$$

PYTHAGOREAN IDENTITIES

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

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

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

EVEN/ODD IDENTITIES

$$\sin(-\theta) = -\sin\theta$$

$$\cos(-\theta) = \cos\theta$$

$$\tan(-\theta) = -\tan\theta$$

$$\csc(-\theta) = -\csc\theta$$

$$\sec(-\theta) = \sec\theta$$

$$\cot(-\theta) = -\cot\theta$$

DOUBLE ANGLE IDENTITIES

$$\sin 2x = 2\sin x\cos x$$

$$\cos 2x = \cos^2 x - \sin^2 x$$

$$\cos 2x = 2\cos^2 x - 1$$

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

$$\tan 2x = \frac{2\tan x}{1 - \tan^2 x}$$

DO ALL WORK ON NOTEBOOK PAPER. DO NOT WRITE ON THIS SHEET.

For #1- 2 , find the limit.

1) $\lim_{h \to 0} \dfrac{\tan^{-1}(1+h) - \dfrac{\pi}{4}}{h}$

2) $\lim_{x \to 1} \dfrac{x^2}{\ln x}$

For #3-9, find the derivative.

3) $y = \ln(1 + e^x)$

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

5) $y = \dfrac{2x - 6}{3x + 5}$

6) $y = \sqrt[7]{x^3 - 4x^2}$

7) $f(x) = (x+2)^2(2x-5)^3$

8) $f(x) = 2\sqrt{x} - \dfrac{1}{2\sqrt{x}}$

9) If $xy^2 - y^3 = x^2 - 5$, then $\dfrac{dy}{dx} =$

In #10-11, use the table below to find the value of the first derivative of the given functions for the given value of x.

x	$f(x)$	$g(x)$	$f'(x)$	$g('x)$
1	3	2	0	¾
2	7	-4	$\dfrac{1}{3}$	-1

10) $[f(x)]^2$ at x = 2

11) $f(g(x))$ at x = 1

For #12-18, find each integral.

12) $\int x^2 \ln x \, dx$

13) $\int \frac{5x}{\sqrt{x+2}} dx$

14) $\int x\sqrt{9-5x^2} \, dx$

15) $\int \frac{e^{2x}}{\sqrt{49-e^{4x}}} dx$

16) $\int \frac{x^3}{\sqrt{1+x^4}} dx$

17) $\int \frac{x^2+2x}{x^2+2x+1} dx$

18) $\int \sqrt{\tan x} \sec^2 x dx$

19) What are all the values of k for which $\int_2^k x^5 dx = 0$?

20) If $\int_a^b g(x)dx = 4a + b$, then $\int_a^b [g(x) + 7]dx =$

21) A particle moves along the x-axis so that, at any time $t \geq 0$, its acceleration is given by $a(t) = 6t + 6$. At time $t = 0$, the velocity of the particle is -9, and its position is -27.

(a) Find $v(t)$, the velocity of the particle at any time $t \geq 0$.

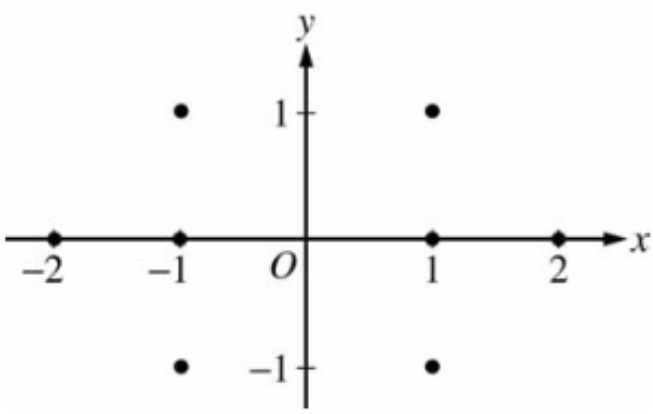
(b) For what values of $t \geq 0$ is the particle moving to the right. Explain why.

(c) Find $x(t)$, the position of the particle at any time $t \geq 0$.

(d) Find $x(4)$.

22) Consider the differential equation $\frac{dy}{dx} = \frac{1+y}{x}$ where x≠0.

a). On the axes provided, sketch a slope field for the given differential equation at the eight point indicated.



b) Find the particular solution y = $f(x)$ to the differential equation with the initial condition $f(-1) = 1$.

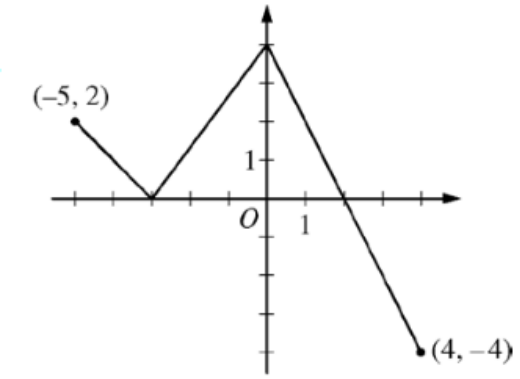
23) Find the region in the first quadrant under the graph of $y = \frac{1}{\sqrt{x}}$ for $4 \le x \le 9$.

a) Find the area of R.

b) If the line x = k divides the region R into two regions of equal area, what is the value of k?

c) Find the volume of the solid whose base is the region R and whose cross sections cut by planes perpendicular to the x-axis are squares.

24) The function $f(x)$ is defined on the closed interval [-5, 4]. The graph of $f(x)$ consists of three line segments and is shown at the right.



Graph of f

Let g be the function defined by

$$g(x) = \int_{-3}^{x} f(t)dt$$

a) Find g(3).

b) On what open intervals contained in -5 < x < 4 is the graph of g both increasing and concave down? Give a reason for your answer.

c) The function $h(x)$ is defined by $h(x) = \frac{g(x)}{5x}$. Find $h'(3)$.

d) The function p is defined by p(x) = $f(x^2 - x)$. Find the slope of the line tangent to the graph of p at the point where x = -1.

Apply the integrals.

25) $\frac{dy}{dx} = \frac{3y}{2+x}$

26) $\frac{dy}{dx} = y \sin x$

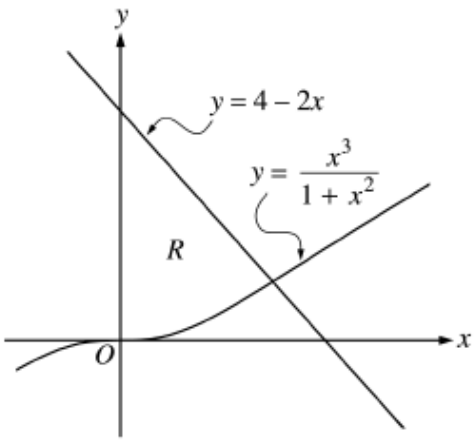
27) Find the particular solution to the differential equation $\frac{du}{dv} = uv \sin v^2$ if $u(0) = 1$.

Let R be the region bounded by the y-axis and the graphs of $y = \dfrac{x^3}{1+x^2}$ and $y = 4 - 2x$, as shown in the figure above.

(a) Find the area of R.

(b) Find the volume of the solid generated when R is revolved about the x-axis.

(c) The region R is the base of a solid. For this solid, each cross section perpendicular to the x-axis is a square. Find the volume of this solid.



28) Let R be the region in the first quadrant under the graph of $y = \dfrac{1}{\sqrt{x}}$ for $4 \le x \le 9$.

(a) find the area of R.

(b) If the line x = k divides the region R into two regions of equal area, what is the value of k?

(c) Find the volume of the solid whose base is the region R and whose cross sections cut by planes perpendicular to the x-axis are squares.