Summer Assignment AP Calculus

Complete the packet. You may use a calculator and reference materials, if necessary.

This assignment is due the **First** day of class, and you will be tested on this material within the first few days of school.

Name:_____

Teacher:_____Period:_____

A. P. Calculus AB
Summer Assignment

For each of the following, solve showing all work and clearly explaining how your answers have been determined and write answer is complete simplified form.

I.   For problems 1 – 16, let:

$$f(x) = 3 - \sqrt{2x + 5}$$

$$g(x) = \frac{4 - x}{2x^2 - 5x - 42}$$

$$k(x) = 7x - 4$$

$$j(x) = \frac{3x - 2}{2x + 3}$$

1. Find the domains of f(x), g(x), k(x), and j(x).

2. Find the ranges of f(x) and k(x).

3. Find (k + j)(x)

4. Find (j/g)(x)

5. Find (fg)(x)

6. Find j(k(x))

7. Find k(j(x))

8. Find j(7x) – 4

9. Find 7j(x) – 4

10. Find 7j(x – 4)

11. Find f(x + h).

12. Find
    $$j^{-1}(x)$$

13. Find the zeros of f(x), g(x), k(x), and j(x).

14. Find the y-intercepts of f(x), g(x), k(x), and j(x).

15. Find the x-intercepts of f(x), g(x), k(x), and j(x).

16. Find $\dfrac{j(x+h) - j(x)}{h}$ and simplify.

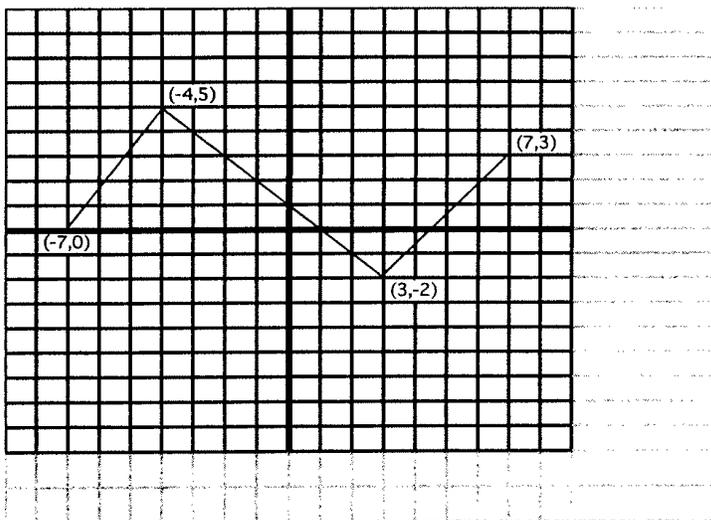17. Identify each function below as even, odd, both, or neither.

a. $f_1(x) = \dfrac{x^2 + 2}{x^4 - 5}$

c. $f_3(x) = 2x^5 + 6x$

b. $f_2(x) = 0$

d. $f_4(x) = 2x^5 + 6$

18. Given this graph, draw the graphs of the following:
   (**each on a separate graph**)

a. f(x+1)

b. f(x) +1

c. f(-x)

d. -f(x)

e. f(-3x)

f. -3f(x)

g. |f(x)|

h. f(|x|)

i. f(3-x)-4

II. For # 1 – 4,

Use the **properties** of limits to find each limit. Show the work necessary to demonstrate the use of those limits properties.

1. Find $\lim\limits_{x \to 2}(3x+4)$.

2. Find $\lim\limits_{x \to -2} \dfrac{x^2+5}{1-x}$

3. Find $\lim\limits_{x \to 0} \dfrac{x^2+2x}{x}$

4. Find $\lim\limits_{x \to 3} \dfrac{x^2+2x}{x}$

For # 5 – 8, graph each piecewise function then determine the limits indicated by referring to the graph.

5.
$\lim\limits_{x \to 1} f(x)$

$$f(x) = \begin{cases} x+3 & x < -1 \\ 5-x & -1 \le x \le 3 \\ \sqrt{x+15} & 3 < x \end{cases}$$

6.
$\lim\limits_{x \to 1} g(x)$

$$g(x) = \begin{cases} x+3 & x < 1 \\ \sqrt{x+15} & 1 < x \end{cases}$$

7.

$$\lim_{x \to 1} h(x) \text{ and } h(1)$$

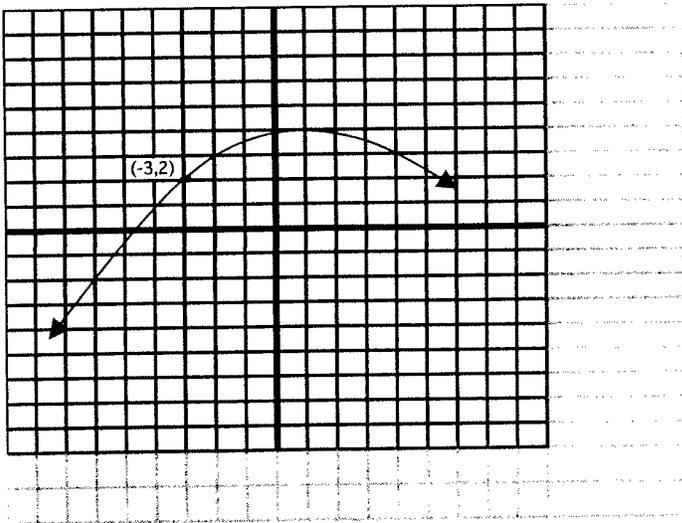$$h(x) = \begin{cases} x+3 & x < 1 \\ \sqrt{\pi} & x = 1 \\ \sqrt{x+15} & 1 < x \end{cases}$$

8.

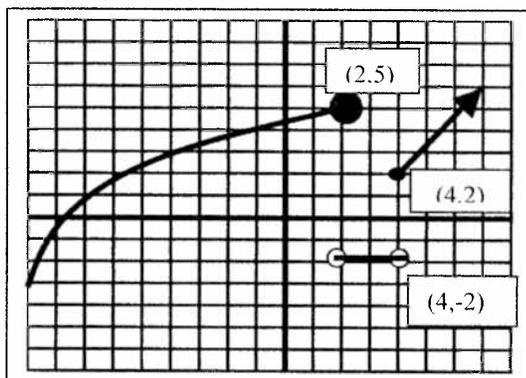$$\lim_{x \to 1} f(x)$$

$$f(x) = \begin{cases} 23x-8 & x < 0.99 \\ x-5 & 0.99 \le x \le 1.01 \\ 8-23x & 1.01 < x \end{cases}$$

9. Find $\lim_{x \to -3}$ of the function in this graph:

(-3,2)

10. Find $\lim\limits_{x \to 3}$ of the function in this graph:

(2.5)

(4,2)

(4,-2)

Part III Logarithmic and Exponential Functions
Exponential Functions
                    Properties of Logarithms
Let a be a positive number such that $a \neq 1$, and let n be a real number. If u and v are positive real numbers, then the following properties are true.

$\log_a (uv) = \log_a u + \log_a v$ $\qquad\qquad$ $\ln(uv) = \ln u + \ln v$

$\log_a \dfrac{u}{v} = \log_a u - \log_a v$ $\qquad\qquad$ $\ln \dfrac{u}{v} = \ln u - \ln v$

$\log_a u^n = n \log_a u$ $\qquad\qquad$ $\ln u^n = n \ln u$

Use the Properties of Logarithms to rewrite the expression in a form with no logarithm of a product, quotient, or power.

1. $\log_2 6x$ $\qquad\qquad\qquad$ 2. $\log_3 \sqrt{5}$

3. $\log_5 x^3 y^6$ $\qquad\qquad\qquad$ 4. $\ln \dfrac{ab}{\sqrt[3]{c}}$

Write the following expressions as a Single Logarithm

5. $3\log x + \dfrac{1}{2}\log x + 1$

6. $3\ln s + \dfrac{2}{3}\ln t - 4\ln t^2 + 1$

Solve the Exponential Equations

7. $3^{x+2} = 7$

8. $8e^{2x} = 20$

9. $e^{2x} - e^x - 6 = 0$

10. $3x^2 e^x + x^3 e^x = 0$

Solve the logarithmic Equations

11. $\log_2 25 - x = 3$

12. $4 + 3\log 2x = 16$

13. $\log (x+2)(x-1) = 1$

14 Sketch the graph of the logarithmic function $f(x) = \ln x$. Find the x- and y- intercepts. State the domain, range. Tell whether it is increasing or decreasing. Write the equation for all asymptotes.

15. Sketch the graph of the exponential function $f(x) = 2^{-x}$ Find the x- and y- intercepts. State the domain, range. Tell whether it is increasing or decreasing. Write the equation for all asymptotes.

Message To Future A. P. Calculus Students

There are two (2) things that you will need to do by the first day of calculus class in September:

(1) <u>Carefully</u> do the attached worksheet. Be sure to show all work clearly and have it written up in good copy to be handed in on the **first** day of class. This will be your first test grade.

(2) <u>Know</u> the identities and other material listed below. It will be very difficult to get into the classroom on the first day (or second or third) without knowing (well) the material on this review sheet.

The Reciprocal Identities

1. $\sin\theta = \dfrac{1}{\csc\theta}$ or $\csc\theta = \dfrac{1}{\sin\theta}$

2. $\cos\theta = \dfrac{1}{\sec\theta}$ or $\sec\theta = \dfrac{1}{\cos\theta}$

3. $\tan\theta = \dfrac{1}{\cot\theta}$ or $\cot\theta = \dfrac{1}{\tan\theta}$

The Ratio Identities   Note: Be aware of equivalent forms of all the identities.

4. $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$

5. $\cot\theta = \dfrac{\cos\theta}{\sin\theta}$

The Pythagorean Identities

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

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

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

The Sum and Difference Identities

9      $\sin(\alpha+\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta$

10. $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$

11. $\cos(\alpha+\beta)=\cos\alpha\cos\beta-\sin\alpha\sin\beta$

12    $\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin$

13. $\tan(\alpha+\beta)=\dfrac{\tan\alpha+\tan\beta}{1-\tan\alpha\tan\beta}$

14. $\tan(\alpha-\beta)=\dfrac{\tan\alpha-\tan\beta}{1+\tan\alpha\tan\beta}$

The Double Angle Identities

15. $\sin 2\alpha=2\sin\alpha\cos\alpha$

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

16    $\cos 2\alpha=2\cos^2-1$

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

17. $\tan 2\alpha=\dfrac{2\tan\alpha}{1-\tan^2\alpha}$

Note: The Half Angle and Sum/Product Identities are not generally used for A.P.
Calculus AB. They are used in A. P. Calculus BC.
Know the trigonometric function values for special angles:

$\theta(radians)$	$\sin\theta$	$\cos\theta$	$\tan\theta$
0	0	1	0
$\dfrac{\pi}{6}$	$\dfrac{1}{2}$	$\dfrac{\sqrt{3}}{2}$	$\dfrac{1}{\sqrt{3}}$ or $\dfrac{\sqrt{3}}{3}$
$\dfrac{\pi}{4}$	$\dfrac{\sqrt{2}}{2}$	$\dfrac{\sqrt{2}}{2}$	1
$\dfrac{\pi}{3}$	$\dfrac{\sqrt{3}}{2}$	$\dfrac{1}{2}$	$\sqrt{3}$
$\dfrac{\pi}{2}$	1	0	undefined

**** Remember that θ may be measured in degrees and that the values of related angles and related functions must also be known.

Know the appearance of the graphs of

$y = \sin x$

$y = \cos x$

$y = \tan x$

$y = \csc x$

$y = \sec x$

$y = \cot x$

Be able to sketch these graphs quickly and accurately over $[-2\pi, 2\pi]$

Know the quadrants in which each trigonometric function is positive and negative.

If you study this information you will have a easier time to get into the classroom on the first day of school. I'll be looking forward to the beginning of class and working with you for the year

Mrs. Craig