Name _____ **Due: Tuesday, September 2nd**

AP Calculus AB Summer Assignment

Welcome to AP Calculus AB! Before studying calculus, you must be familiar with the properties of functions, the algebra of functions, and the graphs of functions. These functions include those that are **linear, polynomial, rational, exponential, logarithmic, trigonometric, inverse trigonometric, and piecewise defined.** You must also understand the language of functions (domain and range, odd and even, periodic, symmetry, zeros, intercepts, and so on) and know the values of the trigonometric functions of the numbers $0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}$, and their multiples.

Most of the school year must be devoted to topics in *differential* and *integral* calculus. These topics are the focus of the AP Exam. Therefore, this summer assignment is designed to help you review topics from algebra, geometry, and precalculus so that when you arrive in September, you are ready to review the first main theme in Calculus: *limits and continuity.*

Directions: Complete all questions without a calculator. Write neatly and show all work. Box your final answers.

1. Complete the table for the indicated functions.

Function	Domain	Range	Zeros	Symmetry with respect to y-axis or origin	Even or Odd Functions
a) $f(x) = x^2$					
b) $f(x) = x^3$					
c) $f(x) = \|x\|$					
d) $f(x) = \sin x$					
e) $f(x) = \cos x$					
f) $f(x) = \tan x$					
g) $f(x) = \sec x$					
h) $f(x) = e^x$					
i) $f(x) = \frac{1}{x}$					
j) $f(x) = \sqrt{x}$					

2. Sketch the graph of each function and state its domain and range.

a) $h(x) = -(x+2)^3 - 4$

b) $y = 3$

c) $y - 2 = \frac{3}{2}(x-1)$

d) $h(x) = \sqrt{x-6}$

e) $f(x) = \sqrt{9-x^2}$

f) $g(t) = 3\sin \pi t$

g) $y = \log_4(x-2) + 3$

h) $y = x^{2/3}$

i) $f(x) = \begin{cases} x-3, & x < 1 \\ 5, & 1 \le x \le 3 \\ -x^2 + 2, & x > 3 \end{cases}$

3. State the end behavior of the graph of each function.

a) $h(x) = 5x - 4$

b) $f(x) = \frac{1}{x}$

c) $f(x) = -2x^4 - x + 9$

d) $g(x) = 4\left(\frac{1}{2}\right)^x - 3$

4. Identify any vertical asymptote(s) for each function.

a) $f(x) = \frac{x}{x^2+3}$ b) $g(x) = \frac{x+6}{x^2+4x-12}$ c) $y = \cot(2x)$

5. Use the graph of $y = f(x)$ to match the function with its graph.

a) $y = f(x+5)$

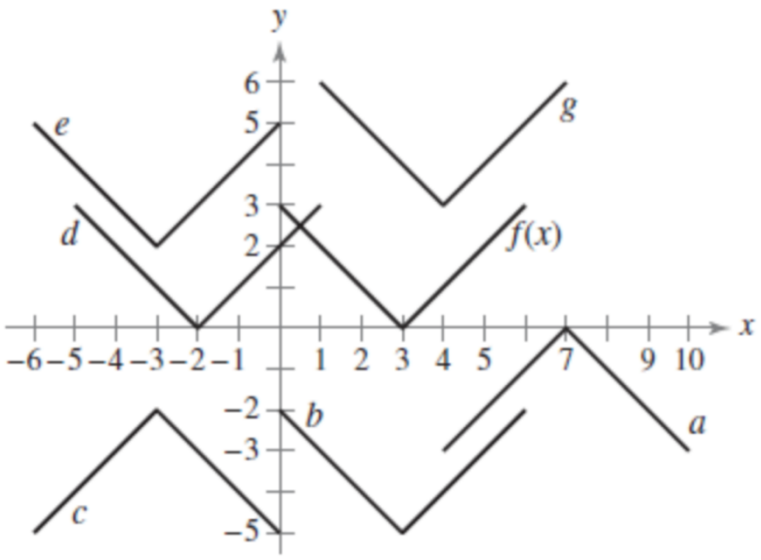
b) $y = f(x) - 5$

c) $y = -f(-x) - 2$

d) $y = -f(x-4)$

e) $y = f(x+6) + 2$

f) $y = f(x-1) + 3$



6. Find the coordinates of the point(s) of intersection.

a) $x + y = 8, 4x - y = 7$ b) $x^2 + y = 6, x + y = 4$ c) $y = x^3, y = x$

7. Write the equation of each line.

a) Through $(0, 3)$ with slope $\frac{3}{4}$ b) Through $(3, -2)$ with slope 3

c) Through $(2, 8)$ and $(5, 0)$

d) Through $(6, 3)$ and $(6, 8)$

e) Through $(-7, -2)$ and parallel to $x = 1$

f) Through $(2, 1)$ and perpendicular to $4x - 2y = 3$

8. Evaluate.

a) $27^{\frac{4}{3}}$

b) $9^{-\frac{1}{2}}$

c) 25^0

d) $\ln e$

e) $\ln(-1)$

f) $\log 1$

f) $\sqrt[4]{16^5}$

g) $\log_{27} 9$

h) $\tan\left(-\frac{3\pi}{2}\right)$

i) $\cos\frac{5\pi}{6}$

j) $\sin\frac{5\pi}{4}$

k) $\cot\pi$

9. Evaluate (if possible) the function at the given value(s) of the independent variable. Simplify the results.

a) For $f(x) = 5 - x^2$, find $f(0), f\left(\sqrt{5}\right), f(-2), f(x - 1)$

b) For $f(x) = 2x^2$, find $\frac{f(x+\Delta x)-f(x)}{\Delta x}$

c) For $f(x) = \begin{cases} |x| + 1, & x < 1 \\ -x + 1, & x \geq 1 \end{cases}$, find $f(-3), f(1), f(3), f(b^2 + 1)$

10. Find the domain of each function.

a) $f(x) = \sqrt{6x}$ b) $y = \sec\frac{\pi t}{4}$ c) $f(x) = \frac{3}{x}$

11. Given $f(x) = \sqrt{x}$ and $g(x) = x^2 - 1$, find each:

a) $f(g(1))$ b) $g(f(1))$ c) $g(f(x))$

12. Given $f(x) = \sin x$ and $g(x) = \pi x$, evaluate each expression:

a) $f(g(2))$ b) $g(f(0))$ c) $f(g(x))$

13. Factor and simplify. Express the answer as a fraction without negative exponents.

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

14. Factor completely.

a) $e^{2x} - 5e^{x} - 6$

b) $x^3 - 125$

c) $(x+2)^{7/2} - (x+2)^{3/2}$

d) $(3n+1)(4n+1)^2 + (n-5)(4n+1)$

15. Simplify the complex fraction.

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

16. Multiply and simplify.

$$\left(x^{5/2} + \frac{3}{\sqrt{2}}\right)^2$$

17. Simplify.

$$\frac{\sec\theta}{\tan\theta}$$

18. Use the properties of logarithms to expand the expression.

$$\ln\frac{(3x^2+2)\sqrt{x+8}}{(x-1)^4}$$

19. Solve for p.

$$hp - 1 = q + kp + 6p$$

20. Solve each equation.

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

b) $\ln e^{-x} = 3$

c) $\frac{e^{2x+3}}{e^3} = 5$

d) $(e^5)^{3x} = e^5 e^{3x}$

e) $\ln x - \ln(x-1) = 1$

f) $x^4 - 9x^2 + 8 = 0$

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

a) $4\cos(3\theta) + \sqrt{3} = 3\sqrt{3}$

b) $5\sin\theta - 3 = 7$

c) $\sin\theta - \cos\theta = 0$

d) $\cot(2\theta) - 1 = 0$