AP Calculus AB *Name*_____
2009 Summer Assignment

Directions:
Show complete work on separate paper. If you experience difficulty, contact Mr. Weisner (bdweisner@smcps.org) at any time during the summer. Bring both this paper and your completed work to class on the first day of school. Just before the first day of school, briefly scan this paper to refamiliarize yourself with its contents.

Functions
Decide whether the given statement is true or false. If true, use specific numbers to show four different examples and explain why it's true. If false, use specific numbers to show a single counter-example and explain why it's false.

1. If x and y are numbers, then $\sqrt{x^2 + y^2} = x + y$.
2. If x and y are numbers, then $(x + y)^2 = x^2 + y^2$.
3. If y is not zero, then $\frac{x}{y^{-2}} = xy^2$.
4. If x is a number, then $|-x| = x$.
5. If x is not zero, then $x^{-3} = -x^3$.
6. If x is a number, then $\sin(2x) = 2\sin(x)$.

[Hint: Just one of these is true!]

Trigonometry
7. Draw the graph of $y = \sin(x)$ on the interval $[0, 2\pi]$. Label both axes, counting by $\frac{\pi}{2}$ on the x-axis. Determine the values of $\sin(0)$, $\sin(\frac{\pi}{2})$, $\sin(\pi)$, $\sin(\frac{3\pi}{2})$, and $\sin(2\pi)$ using your graph.
8. Repeat the steps directly above, but change the function to $y = \cos(x)$.
9. Draw a unit circle. Identify the four quadrantal positions (all 4 intercepts) in terms of π for one positively directed revolution. Give the values of $\sin(x)$, $\cos(x)$ and $\tan(x)$ at each position.
10. Draw a 30^o-60^o-90^o triangle. Label the angles and sides numerically. Give the values of $\sin(x)$, $\cos(x)$ and $\tan(x)$ for both 30^o and 60^o.
11. Repeat the problem directly above using a 45^o-45^o-90^o triangle.
12. Use a unit circle, the definition of $\sin(x)$ and $\cos(x)$ on a unit circle, and a right triangle to illustrate why '$\sin^2(x) + \cos^2(x) = 1$'. What famous theorem are you using?
13. Cite the Trig Cheer. Write 2 complete equations, starting with **sin (*A* + *B*) =** and cos **(*A* + *B*) =**. Identify the two equations the cheer relates to by inserting angles '*A*' and '*B*' among the words.
14. State the 3 matching pairs of reciprocal trig functions.
15. Use a calculator to evaluate $\csc^2(\frac{3\pi}{4})$. Give your answer rounded to three decimal places.

Algebra
16. Express in the form x^n: $\frac{1}{x}$, $\sqrt{x}$, $\sqrt[3]{x^2}$
17. Add 'one' to the power of x: $x^{\frac{1}{2}}$, $x^{-\frac{1}{2}}$, $x^{-\frac{5}{2}}$
18. Pairs of coordinates for inverse functions have what special property? How do the graphs of inverse functions compare?
19. Simplify without using a calculator: $e^{\ln(x)}$, $\ln e^x$. Explain why these simplify.

Logarithms

20. In a single word, what are logs/logarithms?
21. Sketch $y = \ln(x)$.
22. Give the base for each expression: $\log_4(x)$, $\log(x)$, $\ln(x)$.
23. Express $\log_2(128)$ in words, beginning with the words 'What power…' Determine the answer by hand. Use a calculator to check the answer.
24. Use a calculator to find the values of these logs: $\log(23)$, $\ln(e^2)$, $\ln(25.3)$, $\log_3(7)$, $\log_2(21.6)$

Exponentials

25. What qualifies a function as being 'exponential'?
26. Sketch $y = 2^x$ and $y = \left(\frac{1}{2}\right)^x$ on the same axes. Explain the relationship using 'tight' and 'loose'.

Limits

27. What is meant by 'find the limit of a function as x approaches some value c'?
28. Determine the value of $\lim_{x\to 3}(x^2 + 2x + 1)$.

The Fun Part (Extra Credit)

29. Buy, rent, or borrow a copy of the movie entitled <u>*Stand and Deliver*</u>. Write a statement explaining why you think this movie is worthwhile for a student entering an AP Calculus course. This movie may be difficult to locate, but you will enjoy watching it if you can find it. This will count for extra credit, due to the difficulty you may have in procuring a copy of it.