

**2007 - 2008 Log1 Contest Round 3**  
**Mu Individual**

Name: \_\_\_\_\_

<b>4 points each</b>	
1	Evaluate $\cos(\sin(\tan x))$ , if $x=0$ .
2	Evaluate: $\frac{d^2y}{dx^2}(4x^3 + 7x^2 + 11x + 1)$ .
3	A square is inscribed in a circle of diameter 4, what is the area inside the circle but outside the square?
4	If the angle between two points on a circle of radius 4 is $20^\circ$ , then what is the length of the minor arc defined by these two points?
5	What are the roots of the equation $y = 3x^2 + 13x + 4$ ?

<b>5 points each</b>	
6	Find the determinant of the 3x3 matrix: $\begin{bmatrix} 6 & -8 & 5 \\ -6 & 2 & -4 \\ 9 & 3 & 8 \end{bmatrix}$
7	What the largest base 10 number that can be expressed in 3 digits of base 16?
8	If $\sin\theta = \frac{12}{13}$ , then what is $\cos 2\theta$ ?
9	If the letters of the word INDIVIDUAL are rearranged, then how many distinct possibilities are there?
10	What is the sum of the complex (ignore real roots) fifth roots of 1?

<b>6 points each</b>	
11	If the points $(-1,17)$ , $(2,8)$ , and $(3,17)$ are on the parabola $y = Ax^2 + Bx + C$ , then what is $(A + B + C)$ ?
12	What is the sum of the following infinite series: $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \frac{1}{16} - \frac{1}{32} + \frac{1}{64} - \dots$
13	A $60^\circ$ sector is cut from a circle with radius 6 and rolled to form a cone. What is the volume of this cone?
14	A guardsman wants to build a rectangular containment center along a 200m wall. If he has 1000m of electric fencing and has to use the entire wall to form part of one side of the enclosure, then what is the maximum area of such a center?
15	A sphere of radius 2 is centered at the origin. Planes determined by the equations $z=1$ and $z=-1$ slice the sphere into three pieces. What is the volume of the sphere piece that is between the two planes?