**#0 Mu Ciphering**
**MAΘ National Convention 2011**

Find the equation of the tangent line to the graph of $y = \sin x + x$ at the point $(0,0)$.

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Find the range of the function $y = \frac{x+1}{x^2+1}$.

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**#2 Mu Ciphering**
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Find the slope of the line tangent to the graph of $xy^2 + \sin x + y = \frac{x}{y^2} + 1$ at the point $(0,1)$.

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**#3 Mu Ciphering**
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Evaluate the integral $\int_0^3 \left(9-x^2\right)^{1/2} dx$.

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**#4 Mu Ciphering**
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Find the value of $\lim_{n\to\infty}\sum_{x=1}^{n}\left(\frac{x^2+2n^2}{n^3}\right)$.

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**#5 Mu Ciphering**
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**#6 Mu Ciphering**
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Let $f(x)=2x^3+6x-34$ and $g(x)=f^{-1}(x)$.

Find the value of $\left(g'(-6)\right)^{-1}$.

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Find the length of the curve $y = \ln|\cos x|$ from $x = 0$ to $x = \pi/4$.

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**#8 Mu Ciphering**
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A rectangle is inscribed in a triangle whose sides have lengths of 6, 8, and 10. Two vertices of the rectangle are on the longest side of the triangle, and one vertex of the rectangle is on each of the other two sides. Find the maximum area of a rectangle that can be inscribed in this manner.

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**#9 Mu Ciphering**
**MAΘ National Convention 2011**

A trough is 15 ft long and 4 ft across the top. Its ends are isosceles triangles with height 3 ft. Water runs into the trough at a rate of 2.5 cubic ft/min. How fast is the water level rising, in ft/min, when the water is 2 ft deep?

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**#10 Mu Ciphering**
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Let $S$ be the region in the first quadrant enclosed by the $y$-axis and the graphs of $y = \sin x$ and $y = \cos x$. Find the volume of the solid whose base is $S$ and whose cross-sections cut by planes perpendicular to the $x$-axis are squares.

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**#11 Mu Ciphering**
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Find the area inside the outer loop and outside the inner loop of the polar graph $r = 1 + 2\cos\theta$.

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**#12 Mu Ciphering**
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**#13 Mu Ciphering**
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Find the indefinite integral $\int \frac{xe^{2x}}{(2x+1)^2} dx$.

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**#14 Mu Ciphering**
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The position of a particle moving on the $x$-axis is given by $x(t) = \sin t \cos t$ for $t \geq 0$. At the first instant when the acceleration is equal to 1, what is the particle's velocity?

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