

1994 MAΘ NATIONAL CONVENTION
NEW ORLEANS

SCHOOL CODE _____

ALPHA SCHOOL TEAM COMPETITION

PROBLEM # 1

$$\text{Arctan} \left(-\frac{3}{4} \right) + \text{Arcsin} \left(\frac{-7}{25} \right) = \text{Arccos} \underline{\quad ? \quad}$$

ANSWER

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PROBLEM # 2

A lot has the shape of a right triangle with legs of 240 and 300 ft. Find the ground dimensions of the largest 20-story rectangular building that can be constructed on the lot so that the sides of the building are parallel to the legs of the triangle.

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PROBLEM # 3

Find in rectangular form the three distinct values of $(-i)^{2/3}$.

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PROBLEM # 4

For what value(s) of x do/does $(\log_b x)^2 = \log_b x^2$?

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PROBLEM # 5

Change the following spherical coordinates to rectangular coordinates. (π is pi)

$$\left(12, \frac{2\pi}{3}, \frac{5\pi}{6}\right)$$

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PROBLEM # 6

Mr. Morris owns a motel. He has five TV sets that he supplies to guests. There are eight guests (in different rooms) and the probability that a guest wants a TV set is $\frac{1}{2}$. Find the probability that there will be more requests than sets.

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PROBLEM # 7

Simplify to a single trig function.

$$\frac{\sec x \sin 3x + \tan x}{\cos x - \cos 3x}$$

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PROBLEM # 8

Find the area of the region bounded by the lines $y = -\frac{1}{2}x + \frac{1}{2}$, $y = \frac{2}{3}x + \frac{5}{3}$ and $y = 3x - 3$.

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PROBLEM # 9

Evaluate

$$\int \cot^3 2x \, dx$$

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PROBLEM # 10

In a card room of a men's club, there are 5 ordinary decks of playing cards and 3 pinochle decks, all having similar construction and design. One of these 8 decks is chosen at random and a card is randomly drawn from it. If the card is the jack of hearts, what is the probability that it came from the pinochle deck. (A pinochle deck has 48 cards; two each of 9, 10, J, Q, K, and A in the four suits.)

ANSWER
