Alpha Ciphering

Mu Alpha Theta 2006 National Convention

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Question # P

Simplify the following expression into a single trigonometric function

$$\frac{1}{2}(\cos\theta+\sin\theta)(\csc\theta-\sec\theta)$$

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Question # 1

Evaluate $8(\sin^2 x)(\cos x) + \tan^2 x$ if $x = \frac{\pi}{3}$.

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Question # 2

Two consecutive positive integers *a* and *b* exist such that $a^2 - b^2 = 101$. What is the value of *a*?

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Question # 3

Solve for x over the set of real numbers:

$$\sqrt{x^4 + x^4 + x^4 + x^4} = 4$$

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Question # 4

Find the volume of the solid generated by revolving a rectangle with vertices (2,2), (2,5), (5,2) and (5,5) about the *y*-axis.

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Question # 4

Find the volume of the solid generated by revolving a rectangle with vertices (2,2), (2,5), (5,2) and (5,5) about the *y*-axis.

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Question # 4

Find the volume of the solid generated by revolving a rectangle with vertices (2,2), (2,5), (5,2) and (5,5) about the *y*-axis.

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Question #4

Find the volume of the solid generated by revolving a rectangle with vertices (2,2), (2,5), (5,2) and (5,5) about the *y*-axis.

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Question # 5

Solve for x: $(2+2i)^8 = 4^x$, where $i = \sqrt{-1}$

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Question # 6

What is the sum of all integers which belong to the domain of

$$f(x)=\frac{2x}{\sqrt{7x-x^2-10}}?$$

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Question # 7

If $\tan\alpha = \frac{4}{3}$, where α is in quadrant III, and if $\cos\beta = \frac{-7}{25}$, where β is in quadrant II, evaluate $\sin(\alpha - \beta)$.

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Question # 7

If $\tan\alpha = \frac{4}{3}$, where α is in quadrant III, and if $\cos\beta = \frac{-7}{25}$, where β is in quadrant II, evaluate $\sin(\alpha - \beta)$.

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Question # 8

A pinochle deck consists of 48 cards. There are 6 different face values (nine, ten, jack, queen, king, and ace), 4 different suits (clubs, diamonds, hearts, and spades), and there are 2 of each card in the deck. Two cards are drawn at random from the deck without replacement. If P = the probability that the cards have the same face value, and Q = the probability that the cards are the same suit, find P + Q.

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Question # 8

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Question # 9

Evaluate: $\lim_{x\to 4}\left(\frac{2x-8}{x^2-3x-4}+\frac{x-4}{\sqrt{x}-2}\right)$

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Question # 9

Evaluate: $\lim_{x\to 4}\left(\frac{2x-8}{x^2-3x-4}+\frac{x-4}{\sqrt{x}-2}\right)$

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Question # 10

Given the equation $2e^{2x} + \frac{30}{e^{2x}} = 17$. If the sum of all real solutions to this equation is equal to ln *p*, then what is the value of *p*?

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Question # 10

Given the equation $2e^{2x} + \frac{30}{e^{2x}} = 17$. If the sum of all real solutions to this equation is equal to ln *p*, then what is the value of *p*?

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Question # 11

Given that k is a positive real number, find (in terms of *k*) the area of the region bounded by the equation $|x|+|y|=k$.

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Question # 12

If $\frac{A}{x-2}+\frac{B}{x-4}=\frac{8x-26}{x^2-6x+8}$,

then find the value of A^B.

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Question # 12

If $\frac{A}{x-2}+\frac{B}{x-4}=\frac{8x-26}{x^2-6x+8}$,

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