

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 $x = \frac{\pi}{3}$. Evaluate

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Question #2



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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

Question # 3

Solve for *x* over the set of real numbers: $\sqrt{x^4 + x^4 + x^4 + x^4} = 4$ Solve for *x* over the set of real numbers: $\sqrt{x^4 + x^4 + x^4 + x^4} = 4$



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Question # 3

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Question #4



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Question #4

Find the volume of the solid generated by revolving a rectangle with vertices (2, 2)

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



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

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Question #6



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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



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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 $\sin(\alpha - \beta)$.

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 #7
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If \tan \alpha = \frac{4}{3}, where \alpha is in quadrant III, and if \cos \beta = \frac{-7}{25}, where \beta 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

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



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Question # 10



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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

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Question	#	10
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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



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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} .

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

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Question # 12

If
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Question	#	12
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