

Algebra II Question #1  
Miami Sunset Invitational - January 26, 2002

Find the vertices of the region described by this system of inequalities.

$$\begin{cases} 2x - y \leq 5 \\ 3x + y \geq 0 \\ y \leq 0 \end{cases}$$

Algebra II Question #2  
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Write each expression in simplified  $a + bi$  form then find  $A + B + C + D$ .

$$i = \sqrt{-1}.$$

$$A = 3(2 - \sqrt{-9}) + 2i(4i - 7)$$

$$B = (3 + 7i)(6 - 2i)$$

$$C = \frac{6 + 10i}{2i}$$

$$D = \frac{-4 + i}{1 + 4i}$$

Algebra II Question #3  
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Find the height of a rectangular solid if the volume is  $80x$ ,  
the width is  $x + 5$  and the length is  $2x + 4$ .

Algebra II Question #4  
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$$A = \text{the value of } f(-6) \text{ given } f(x) = \begin{cases} 2x - 1, x \leq -2 \\ x + 6, x > -2 \end{cases}$$

$$B = \text{the value of } f(1) - f(5), \text{ given } f(x) = |x - 3| - 5$$

$$C = \text{the value of } f(x + 2) - f(x) \text{ given } f(x) = x^2 - 3x + 4$$

$$D = \text{the value of } f(x + 1) + f(1) \text{ given } f(x) = 3x - 7$$

Find  $A + B + C + D$ .

Algebra II Question #5  
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A = the value of  $x$ :  $9^{x+2} = 3^{3x-3}$

B = the positive root of  $2(x+2)^{\frac{2}{3}} = 162$

C = the value of  $-4^2 - x$  when  $\sqrt{x+2} = 6$

Find the value of  $\frac{A-B}{C}$ . Express this number as a decimal.

Algebra II Question #6  
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Given that  $\frac{1}{1 + \frac{1}{1+x}} = \frac{1}{2}$  find the value of  $3 + \frac{x}{3}$ .

Algebra II Question #7  
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Find the sum of the numerator and denominator of this expression when it is simplified.

$$\frac{x^3 - 1}{8x^2 + 16x + 6} \cdot \frac{6x^2 - 7x - 24}{x^2 - 1} \div \frac{9x^2 - 6x - 48}{12x^2 + 30x + 12}$$

Algebra II Question #8  
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A = the radius of the circle  $x^2 + y^2 - 6x + 10y + 25 = 0$

B = the  $y$ -coordinate of the vertex of  $y = 2x^2 - 8x + 2$

C = the value of  $[\log(5\log 100)]^2$

D = the coefficient of the fourth term of  $(2x - y)^9$

Find the value of  $\frac{D}{(A+C)^2} - B$ .

Algebra II Question #9

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Evaluate where  $i = \sqrt{-1}$ , give your answer in simplest radical form.

$$\frac{|3+i|+|4+3i|}{|2+i|+|1-i|}$$

Algebra II Question #10

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Evaluate each.

$$A = (625)^{-\frac{1}{4}}$$

$$B = (-64)^{\frac{2}{3}}$$

$$C = \sqrt[3]{216^2}$$

$$D = \frac{\sqrt[3]{8^2}}{\sqrt[4]{16^{-2}}}$$

Find the value of  $A^{-1} \cdot \frac{B}{D} + C$ .

Algebra II Question #11

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Each equation represents a different value for  $x$ . Solve each equation for its value of  $x$ .

Then find the sum of all values of  $x$ .

A.  $\log_x 36 = 2$

B.  $\log_6 x = -3$

C.  $\log_3 \frac{1}{\sqrt{27}} = x$

Algebra II Question #12

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What is the units digit of  $147^{77} + 73^{126} + 208^{34} + 112^{92}$  ?

Algebra II Question #13  
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The sum of two numbers is 16. Three times the reciprocal of the first number added to three times the reciprocal of the second number is  $\frac{4}{5}$ . What is three times the larger of the two numbers minus five times the smaller of the two numbers?

Algebra II Question #14  
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The cost of manufacturing a certain product is determined by the function  $C = 5x + 2y$ . Find the minimum cost with the given constraints to manufacture the product.

$$\begin{cases} y \geq 9 - 2x \\ y + x \geq 6 \\ x \geq 0 \\ y \geq 0 \end{cases}$$

Algebra II Question #15  
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Solve the system  $\begin{cases} \log 2x + y = \log 2 \\ 2\log x - y = 0 \end{cases}$  in the form  $(x, y)$ . What is the sum of  $x$  and  $y$ ?