Alabama Statewide Math Contest - Round 3 Division Two

University of North Alabama

April 11, 2015

Scoring

Scoring

0:00 - 0:30	10 points
0:31 - 1:00	8 points
1:01 - 1:30	6 points
1:31 - 2:00	4 points

If the first person to answer is correct, they receive 2 Bonus Points.

Rules

Rules

1. Answers must be in answer box provided to be counted. Units such as cm, in, etc. are **not** necessary.
2. Fractions must be reduced and left as rational numbers. Improper fractions are acceptable.
3. The numbers π and e must be left as such.
4. Complex numbers must be put into $a + bi$ form.
5. Answers with radicals must be simplified. Denominators must be rationalized.
6. Exponents should be positive.
7. Answers involving trigonometric functions should be simplified as much as possible.
8. $\log(x)$ means $\log_{10}(x)$ and $\ln(x)$ means $\log_e(x)$.
9. The time limit for **all** problems is 2 minutes.

Sample Problem # 1

Sample Problem

RESET

Solve for x in the equation

$$x^2 - 6x - 3 = 0$$

Sample Problem

Answer: $3 + 2\sqrt{3}$,and $3 - 2\sqrt{3}$.

Round 1

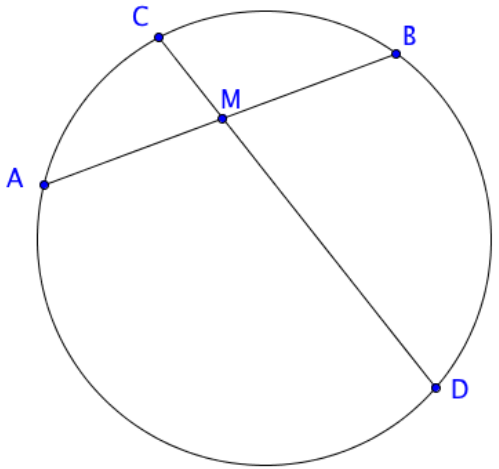
Geometry

Geometry Question # 1

Geometry Question # 1

RESET

In the figure shown, chord $\overline{AB}$ has length 16 and is bisected by chord $\overline{CD}$. What is the length of CD if DM is four times as long as CM?



Geometry Question # 1

Answer: 20

Geometry Question # 2

Geometry Question # 2

RESET

A metal strip is bent into the shape of a right triangle with legs of x and $x+2$ and hypotenuse of $x+4$. Find the area of the triangle.

Geometry Question # 2

Answer: 24

Round 1

Algebra II & Trig

Algebra II & Trig Question # 3

Algebra II & Trig Question # 3

RESET

The axis of symmetry of $f(x) = 2x^2 + bx + 17$ is $x = -3$. Find b.

Algebra II & Trig Question # 3

Answer: 12

Algebra II & Trig Question # 4

Algebra II & Trig Question # 4

RESET

How many integers are in the domain of the function f where

$$f(x) = \frac{\sqrt{x+3}}{\sqrt{1-x}}.$$

Round 1: Algebra II & Trig Question # 4

Answer: 4

Round 1

Comprehensive Part 1

Comprehensive Part 1
Question # 5

Comprehensive Part 1 Question # 5

RESET

Solve for x:

$$100^{1/x}100^{2/x}\cdots 100^{11/x} = 10000$$

Comprehensive Part 1 Question # 5

Answer: 33

Comprehensive Part 1
Question # 6

Comprehensive Part 1 Question # 6

RESET

Find the exact value of $\cos\left(\frac{16\pi}{3}\right)$.

Comprehensive Part 1 Question # 6

Answer: $-\frac{1}{2}$

Round 1

Comprehensive Part 2

Comprehensive Part 2
Question # 7

Comprehensive Part 2 Question # 7

RESET

A triangle has angles of 30° and 45°. If the side opposite the 45° angle has length 8, then what is the length of the side opposite the 30° angle?

Comprehensive Part 2 Question # 7

Answer: $4\sqrt{2}$

Comprehensive Part 2
Question # 8

Comprehensive Part 2 Question # 8

RESET

What is the area of the circle that is defined by the equation $x^2 + 2x + y^2 + 6y + 6 = 0$?

Comprehensive Part 2 Question # 8

Answer: 4π

Round 1

Team

Team Question # 9

Team Question # 9

RESET

A pyramid has a height of 5, and a base in the shape of an equilateral triangle. If each median of the triangle has length 3, find the volume of the pyramid.

Team Question # 9

Answer: $5\sqrt{3}$

Team Question # 10

Team Question # 10

RESET

How many vertical asymptotes does the graph of

$$y = \frac{x}{x^3 + 8x^2 + 20x}$$

have?

Team Question # 10

Answer: 0

End of Round 3