Alpha Ciphering
Test #621
Question #0

Alpha Ciphering
Test #621
Question #0

Alpha Ciphering
Test #621
Question #0

Alpha Ciphering
Test #621
Question #0

#0 Alpha Ciphering
MAΘ National Convention 2023

Find the period of the function

$$f(x) = cos^4 x - sin^4 x$$

#0 Alpha Ciphering
MAΘ National Convention 2023

Find the period of the function

$$f(x) = cos^4 x - sin^4 x$$

#0 Alpha Ciphering
MAΘ National Convention 2023

Find the period of the function

$$f(x) = cos^4 x - sin^4 x$$

#0 Alpha Ciphering
MAΘ National Convention 2023

Find the period of the function

$$f(x) = cos^4 x - sin^4 x$$

Alpha Ciphering
Test #621
Question #1

Alpha Ciphering
Test #621
Question #1

Alpha Ciphering
Test #621
Question #1

Alpha Ciphering
Test #621
Question #1

#1 Alpha Ciphering
MAΘ National Convention 2023

Find the next term in the cubic sequence:

$$-2, 6, 26, 64, 126, \ldots$$

#1 Alpha Ciphering
MAΘ National Convention 2023

Find the next term in the cubic sequence:

$$-2, 6, 26, 64, 126, \ldots$$

#1 Alpha Ciphering
MAΘ National Convention 2023

Find the next term in the cubic sequence:

$$-2, 6, 26, 64, 126, \ldots$$

#1 Alpha Ciphering
MAΘ National Convention 2023

Find the next term in the cubic sequence:

$$-2, 6, 26, 64, 126, \ldots$$

Alpha Ciphering
Test #621
Question #2

Alpha Ciphering
Test #621
Question #2

Alpha Ciphering
Test #621
Question #2

Alpha Ciphering
Test #621
Question #2

#2 Alpha Ciphering
MAΘ National Convention 2023

What is the largest area possible for a triangle formed by the endpoints of a latus rectum and an endpoint of the major axis for the conic

$$4x^2 + 9y^2 - 16x + 90y + 205 = 0$$

#2 Alpha Ciphering
MAΘ National Convention 2023

What is the largest area possible for a triangle formed by the endpoints of a latus rectum and an endpoint of the major axis for the conic

$$4x^2 + 9y^2 - 16x + 90y + 205 = 0$$

#2 Alpha Ciphering
MAΘ National Convention 2023

What is the largest area possible for a triangle formed by the endpoints of a latus rectum and an endpoint of the major axis for the conic

$$4x^2 + 9y^2 - 16x + 90y + 205 = 0$$

#2 Alpha Ciphering
MAΘ National Convention 2023

What is the largest area possible for a triangle formed by the endpoints of a latus rectum and an endpoint of the major axis for the conic

$$4x^2 + 9y^2 - 16x + 90y + 205 = 0$$

Alpha Ciphering
Test #621
Question #3

Alpha Ciphering
Test #621
Question #3

Alpha Ciphering
Test #621
Question #3

Alpha Ciphering
Test #621
Question #3

#3 Alpha Ciphering
MAΘ National Convention 2023

Find the product of the real solutions of the equation

$$x^2 + 18x + 30 = 2\sqrt{x^2 + 18x + 45}$$

#3 Alpha Ciphering
MAΘ National Convention 2023

Find the product of the real solutions of the equation

$$x^2 + 18x + 30 = 2\sqrt{x^2 + 18x + 45}$$

#3 Alpha Ciphering
MAΘ National Convention 2023

Find the product of the real solutions of the equation

$$x^2 + 18x + 30 = 2\sqrt{x^2 + 18x + 45}$$

#3 Alpha Ciphering
MAΘ National Convention 2023

Find the product of the real solutions of the equation

$$x^2 + 18x + 30 = 2\sqrt{x^2 + 18x + 45}$$

Alpha Ciphering
Test #621
Question #4

Alpha Ciphering
Test #621
Question #4

Alpha Ciphering
Test #621
Question #4

Alpha Ciphering
Test #621
Question #4

#4 Alpha Ciphering
MAΘ National Convention 2023

How many even integers between 4000 and 7000 have four different digits?

#4 Alpha Ciphering
MAΘ National Convention 2023

How many even integers between 4000 and 7000 have four different digits?

#4 Alpha Ciphering
MAΘ National Convention 2023

How many even integers between 4000 and 7000 have four different digits?

#4 Alpha Ciphering
MAΘ National Convention 2023

How many even integers between 4000 and 7000 have four different digits?

Alpha Ciphering
Test #621
Question #5

Alpha Ciphering
Test #621
Question #5

Alpha Ciphering
Test #621
Question #5

Alpha Ciphering
Test #621
Question #5

#5 Alpha Ciphering
MAΘ National Convention 2023

Find the sum of the roots of:

$$f(x) = x^{2023} + \left(\frac{1}{2} - x\right)^{2023}$$

#5 Alpha Ciphering
MAΘ National Convention 2023

Find the sum of the roots of:

$$f(x) = x^{2023} + \left(\frac{1}{2} - x\right)^{2023}$$

#5 Alpha Ciphering
MAΘ National Convention 2023

Find the sum of the roots of:

$$f(x) = x^{2023} + \left(\frac{1}{2} - x\right)^{2023}$$

#5 Alpha Ciphering
MAΘ National Convention 2023

Find the sum of the roots of:

$$f(x) = x^{2023} + \left(\frac{1}{2} - x\right)^{2023}$$

Alpha Ciphering
Test #621
Question #6

Alpha Ciphering
Test #621
Question #6

Alpha Ciphering
Test #621
Question #6

Alpha Ciphering
Test #621
Question #6

#6 Alpha Ciphering
MAΘ National Convention 2023

Evaluate: $\cos\left(sec^{-1}\left(\frac{5\sqrt{2}}{2}\right)+sin^{-1}\left(-\frac{\sqrt{3}}{10}\right)\right)$

#6 Alpha Ciphering
MAΘ National Convention 2023

Evaluate: $\cos\left(sec^{-1}\left(\frac{5\sqrt{2}}{2}\right)+sin^{-1}\left(-\frac{\sqrt{3}}{10}\right)\right)$

#6 Alpha Ciphering
MAΘ National Convention 2023

Evaluate: $\cos\left(sec^{-1}\left(\frac{5\sqrt{2}}{2}\right)+sin^{-1}\left(-\frac{\sqrt{3}}{10}\right)\right)$

#6 Alpha Ciphering
MAΘ National Convention 2023

Evaluate: $\cos\left(sec^{-1}\left(\frac{5\sqrt{2}}{2}\right)+sin^{-1}\left(-\frac{\sqrt{3}}{10}\right)\right)$

Alpha Ciphering
Test #621
Question #7

Alpha Ciphering
Test #621
Question #7

Alpha Ciphering
Test #621
Question #7

Alpha Ciphering
Test #621
Question #7

#7 Alpha Ciphering
MAΘ National Convention 2023

A line with a slope of 3 is tangent to the graph $y = x^2 - 4x + 6$. What is the x-intercept of this line?

#7 Alpha Ciphering
MAΘ National Convention 2023

A line with a slope of 3 is tangent to the graph $y = x^2 - 4x + 6$. What is the x-intercept of this line?

#7 Alpha Ciphering
MAΘ National Convention 2023

A line with a slope of 3 is tangent to the graph $y = x^2 - 4x + 6$. What is the x-intercept of this line?

#7 Alpha Ciphering
MAΘ National Convention 2023

A line with a slope of 3 is tangent to the graph $y = x^2 - 4x + 6$. What is the x-intercept of this line?

Alpha Ciphering
Test #621
Question #8

Alpha Ciphering
Test #621
Question #8

Alpha Ciphering
Test #621
Question #8

Alpha Ciphering
Test #621
Question #8

#8 Alpha Ciphering
MAΘ National Convention 2023

Evaluate:

$$\sum_{k=4}^{\infty} \frac{-1}{k^2 - 5k + 6}$$

#8 Alpha Ciphering
MAΘ National Convention 2023

Evaluate:

$$\sum_{k=4}^{\infty} \frac{-1}{k^2 - 5k + 6}$$

#8 Alpha Ciphering
MAΘ National Convention 2023

Evaluate:

$$\sum_{k=4}^{\infty} \frac{-1}{k^2 - 5k + 6}$$

#8 Alpha Ciphering
MAΘ National Convention 2023

Evaluate:

$$\sum_{k=4}^{\infty} \frac{-1}{k^2 - 5k + 6}$$

Alpha Ciphering
Test #621
Question #9

Alpha Ciphering
Test #621
Question #9

Alpha Ciphering
Test #621
Question #9

Alpha Ciphering
Test #621
Question #9

#9 Alpha Ciphering
MAΘ National Convention 2023

A square is inscribed in an isosceles triangle, with one of its sides on the triangle's base. The length of the base of the triangle is 10 and its legs have length of 13. What is the side length of the square?

#9 Alpha Ciphering
MAΘ National Convention 2023

A square is inscribed in an isosceles triangle, with one of its sides on the triangle's base. The length of the base of the triangle is 10 and its legs have length of 13. What is the side length of the square?

#9 Alpha Ciphering
MAΘ National Convention 2023

A square is inscribed in an isosceles triangle, with one of its sides on the triangle's base. The length of the base of the triangle is 10 and its legs have length of 13. What is the side length of the square?

#9 Alpha Ciphering
MAΘ National Convention 2023

A square is inscribed in an isosceles triangle, with one of its sides on the triangle's base. The length of the base of the triangle is 10 and its legs have length of 13. What is the side length of the square?

Alpha Ciphering
Test #621
Question #10

Alpha Ciphering
Test #621
Question #10

Alpha Ciphering
Test #621
Question #10

Alpha Ciphering
Test #621
Question #10

#10 Alpha Ciphering
MAΘ National Convention 2023

The cross product of the vectors $\langle 4,-1,0\rangle$ and $\langle -2,1,3\rangle$ is $\langle R,O,B\rangle$. What is $R\cdot O\cdot B$?

#10 Alpha Ciphering
MAΘ National Convention 2023

The cross product of the vectors $\langle 4,-1,0\rangle$ and $\langle -2,1,3\rangle$ is $\langle R,O,B\rangle$. What is $R\cdot O\cdot B$?

#10 Alpha Ciphering
MAΘ National Convention 2023

The cross product of the vectors $\langle 4,-1,0\rangle$ and $\langle -2,1,3\rangle$ is $\langle R,O,B\rangle$. What is $R\cdot O\cdot B$?

#10 Alpha Ciphering
MAΘ National Convention 2023

The cross product of the vectors $\langle 4,-1,0\rangle$ and $\langle -2,1,3\rangle$ is $\langle R,O,B\rangle$. What is $R\cdot O\cdot B$?

Alpha Ciphering
Test #621
Question #11

Alpha Ciphering
Test #621
Question #11

Alpha Ciphering
Test #621
Question #11

Alpha Ciphering
Test #621
Question #11

#11 Alpha Ciphering
MAΘ National Convention 2023

Find the sum of all real values of x such that:

$$\frac{2}{log_{x+1} 4} + 3\, log_8(x-3) - 4\, log_{16} 1\,2 = 0$$

#11 Alpha Ciphering
MAΘ National Convention 2023

Find the sum of all real values of x such that:

$$\frac{2}{log_{x+1} 4} + 3\, log_8(x-3) - 4\, log_{16} 1\,2 = 0$$

#11 Alpha Ciphering
MAΘ National Convention 2023

Find the sum of all real values of x such that:

$$\frac{2}{log_{x+1} 4} + 3\, log_8(x-3) - 4\, log_{16} 1\,2 = 0$$

#11 Alpha Ciphering
MAΘ National Convention 2023

Find the sum of all real values of x such that:

$$\frac{2}{log_{x+1} 4} + 3\, log_8(x-3) - 4\, log_{16} 1\,2 = 0$$

Alpha Ciphering
Test #621
Question #12

Alpha Ciphering
Test #621
Question #12

Alpha Ciphering
Test #621
Question #12

Alpha Ciphering
Test #621
Question #12

#12 Alpha Ciphering
MAΘ National Convention 2023

Two sides of a triangle have lengths of 4 and 7, and the sine of the acute angle between them is $\frac{1}{3}$. If this angle measure is doubled, what is the ratio of the area of the new triangle to the area of the old?

#12 Alpha Ciphering
MAΘ National Convention 2023

Two sides of a triangle have lengths of 4 and 7, and the sine of the acute angle between them is $\frac{1}{3}$. If this angle measure is doubled, what is the ratio of the area of the new triangle to the area of the old?

#12 Alpha Ciphering
MAΘ National Convention 2023

Two sides of a triangle have lengths of 4 and 7, and the sine of the acute angle between them is $\frac{1}{3}$. If this angle measure is doubled, what is the ratio of the area of the new triangle to the area of the old?

#12 Alpha Ciphering
MAΘ National Convention 2023

Two sides of a triangle have lengths of 4 and 7, and the sine of the acute angle between them is $\frac{1}{3}$. If this angle measure is doubled, what is the ratio of the area of the new triangle to the area of the old?