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MU School Bowl

Round # _____

A = _____

B = _____

C = _____

Final answer:

CODE: _____

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A = _____

B = _____

C = _____

Final answer:

CODE: _____

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Round 1

Part 1
Find the limit, if it exists:

$$\lim_{x\to 0}\frac{\sqrt{4-x}-2}{x}$$

A = the value of the limit, if it exists

Part 2
Given $f(x)=-3x^2+8x-1$. Find the point on the graph where the tangent line has a slope of – 4.

B = sum of the coordinates of the point

Part 3
At what x values, if any, does the function $f(x)=\dfrac{x^2-9}{x^2+7x+12}$, have a vertical asymptote?

C =

$$\begin{cases}\text{the x value of the asymptote}\\ \text{the sum of the x values of the asymptotes}\\ \text{nothing, if there are no vertical asymptote(s)}\end{cases}$$

Final answer = $AC + B$

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Round 1

Part 1
Find the limit, if it exists:

$$\lim_{x\to 0}\frac{\sqrt{4-x}-2}{x}$$

A = the value of the limit, if it exists

Part 2
Given $y=\dfrac{4}{3}\sin\left(x+\dfrac{3\pi}{5}\right)-\dfrac{2\pi}{3}$

B = the denominator of the sum of the period and the phase shift

Part 3
At what x values, if any, does the function $f(x)=\dfrac{x^2-9}{x^2+7x+12}$, have a vertical asymptote?

C =

$$\begin{cases}\text{the x value of the asymptote}\\ \text{the sum of the x values of the asymptotes}\\ \text{nothing, if there are no vertical asymptote(s)}\end{cases}$$

Final answer = $AC + B$

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Round 2

Part 1

Given $f(x)=\begin{cases}\dfrac{x+3}{x^2+8x+15}, & x\neq -3\\ k, & x=-3\end{cases}$. Find k so that f(x) is continuous at x = -3.

A = k

Part 2

Solve for x: $3^{\left(\log_3 42-\log_3 6\right)}=x$

B = x

Part 3

Evaluate:

$$\begin{vmatrix}-3 & 2\\ 1 & 5\end{vmatrix}+\begin{vmatrix}1 & -2 & -3 & 0\\ -1 & 1 & 0 & 2\\ 0 & 2 & 0 & 3\\ 3 & 4 & 0 & 2\end{vmatrix}$$

C = sum of the determinants

Final: A^BC

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Round 2

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C = sum of the determinants

Final: A^BC

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Round 3

Part 1
An object thrown upward from the ground with initial speed of 172 ft/s is modeled by $s(t) = -16t^2 + 172t,$ where t is in seconds. What is the instantaneous speed of the object at t = 6 s?

A = the instantaneous speed

Part 2

Evaluate $\int 3(w-2)(4w+7)\,dw$

B = the coefficient of the cubic term

Part 3

The one real zero of the function $f(x) = 3x^3 - 7x^2 - 7x - 10$ lies between what two consecutive integers?

C = product of the two integers

Final: $BC + A$

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Round 3

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Final: $BC + A$

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Round 4

Part 1
Find the point/slope form of the equation of the normal line to the curve $x^2 + y^2 = 10$ at (3,1).

A = slope of the normal line

Part 2
Find the exact solution set of the equation: $\log_4(x+12) = 4 - \log_4(x-12)$

B = x

Part 3
Solve for x on the interval $[0, 2\pi)$ if $\cos x + \sin x \tan x = 2$.

C = largest solution

Final: $12C(AB\pi)^{-1}$

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Round 4

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Find the point/slope form of the equation of the normal line to the curve $x^2 + y^2 = 10$ at (3,1).

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Part 3
Solve for x on the interval $[0, 2\pi)$ if $\cos x + \sin x \tan x = 2$.

C = largest solution

Final: $12C(AB\pi)^{-1}$

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Round 5

Part 1

Evaluate $\int_{-1}^{3} \left(6x^2 + 4x - 2\right) dx$

A = answer

Part 2

In how many ways can the letters in the word TASTEE be arranged?

B = number of ways

Part 3

The minimum value of

$f(x) = x^2 + \frac{2}{x}, on\ \frac{1}{2} \le x \le 2$ is ?

C = the minimum value

Final: $B - C\sqrt{A}$

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Round 5

Part 1

Evaluate $\int_{-1}^{3} \left(6x^2 + 4x - 2\right) dx$

A = answer

Part 2

In how many ways can the letters in the word TASTEE be arranged?

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Part 3

The minimum value of

$f(x) = x^2 + \frac{2}{x}, on\ \frac{1}{2} \le x \le 2$ is ?

C = the minimum value

Final: $B - C\sqrt{A}$

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Round 6

Part 1

Find the sum of the infinite geometric series….1000 + 700 + 490 + 343 + …

A = denominator in the answer

Part 2

A particle moves along the parabola $x = 3y - y^2$ so that $\frac{dy}{dt} = 3$ at all time t.
The speed of the particle when it is at position (1,2) is ?

B = speed

Part 3
If $y = \cot^2 \sqrt{x},$ find y'.

C = degree of cot x function in the final answer

Final: $B^{(A-C)}$

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Round 6

Part 1

Find the sum of the infinite geometric series….1000 + 700 + 490 + 343 + …

A = denominator in the answer

Part 2
A particle moves along the parabola $x = 3y - y^2$ so that $\frac{dy}{dt} = 3$ at all time t.
The speed of the particle when it is at position (1,2) is ?

B = speed

Part 3
If $y = \cot^2 \sqrt{x},$ find y'.

C = degree of cot x function in the final answer

Final: $B^{(A-C)}$

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Round 7

Part 1
Find the equation of the line tangent to the graph of $y = -4x^4 + 8x^2 + 92x$ at $x = 2$.

A = sum of the slope and the y-intercept

Part 2
In the food chain, barracuda feed on bass and bass feed on shrimp. Suppose that the size of the barracuda population is estimated by the function $r(x) = 1000 + \sqrt{20x}$, where x is the size of the bass population. Also suppose that the bass population is estimated by the function $s(x) = 2500 + \sqrt{x}$, where x is the size of the shrimp population.

B = barracuda population when the shrimp population is 4,000,000

Part 3
Evaluate:
$$\int_{\frac{\pi}{12}}^{\frac{\pi}{4}} \frac{\cos 2x}{\sin^2 2x}\, dx$$

C = answer

Final: $C(B) - A$

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Part 2
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B = barracuda population when the shrimp population is 4,000,000

Part 3
Evaluate:
$$\int_{\frac{\pi}{12}}^{\frac{\pi}{4}} \frac{\cos 2x}{\sin^2 2x}\, dx$$

C = answer

Final: $C(B) - A$

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Round 8

Part 1
State the domain of the function:

$$f(x) = \frac{\sqrt{4-x}}{x}$$

A = upper bound of the domain

Part 2

Given $f(x) = \ln\left(x\sqrt{x^2+1}\right)$, find $f'(2)$.

B = denominator - numerator of the answer

Part 3

Suppose that $\sin\theta + \cos\theta = 1.2$

What is the value of $\sin 2\theta$?

C = answer

Final: $\left(\frac{C}{A}\right)^B$

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Round 8

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B = denominator - numerator of the answer

Part 3

Suppose that $\sin\theta + \cos\theta = 1.2$

What is the value of $\sin 2\theta$?

C = answer

Final: $\left(\frac{C}{A}\right)^B$

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Round 9

Part 1

Solve the system: $\begin{cases} x+y=2 \\ x+y^2=4 \end{cases}$

A = sum of all the coordinates of all the points of intersection

Part 2

A red die and a blue die are rolled simultaneously. What is the probability that the red die shows a larger number than the blue die?

B = denominator - numerator
(in lowest terms)

Part 3

Let $f(x)=3x+1$ and $g(x)=2x+5$

Then $f(g(x))-g(f(x))=?$

C = answer

Final: $6A-4B+C$

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Round 9

Part 1

Solve the system: $\begin{cases} x+y=2 \\ x+y^2=4 \end{cases}$

A = sum of all the coordinates of all the points of intersection

Part 2

A red die and a blue die are rolled simultaneously. What is the probability that the red die shows a larger number than the blue die?

B = denominator - numerator
(in lowest terms)

Part 3

Let $f(x)=3x+1$ and $g(x)=2x+5$

Then $f(g(x))-g(f(x))=?$

C = answer

Final: $6A-4B+C$

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Round 10

Part 1
Let $f(x) = x^5 + 1$ and let g(x) be the inverse function of f.

A = the value of $g'(0)$

Part 2

Find the value of x such that $4x+6, x+6, 4x-2$ are the first 3 terms of an arithmetic sequence.

B = x

Part 3
The number of inflection points that $f(x) = 3x^5 - 10x^3$ has is ?

C = number of inflection points

Final: $C - AB$

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Round 10

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Part 2

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Part 3
The number of inflection points that $f(x) = 3x^5 - 10x^3$ has is ?

C = number of inflection points

Final: $C - AB$