Question 1

Let A be the sum of the coefficients of the expansion of $(2x + 3y)^5$

Let B be the sum of the coefficients of the expansion of $(x + y + 3z)^5$

Let C be the coefficient of the x^2y^2 in the expansion of $(5x + 2y)^4$

Let D be the coefficient of the constant term in $(x + \frac{2}{x} + 2y + \frac{1}{y} + 5z + \frac{1}{3z} + 4)^2$

Find $A - B + C + D$.

Question 2

Let A = The sum of the roots of $x^3 - 2x + 1 = 2011$

Let B = The sum of the roots of $\log_3 x = \log_9 x^2 + \log_3(1 + (x-3)(x-2)(x-2011)(x+1))$

Find $A + B$

Question 3

A: If

$$\begin{aligned} a+b &= 7 \\ b+c &= 11 \\ a+c &= 5 \end{aligned}$$

the value of $a+b+c$ is A.

B: If

$$\begin{aligned} ab &= 5 \\ bc &= 4 \\ ac &= 8 \end{aligned}$$

the value of abc is B.

Find AB.

Question 4

For each of the following equations, define the value of an equation to be 4 if it is a hyperbola when graphed on the Cartesian Plane, 2 if it is a circle when graphed on the Cartesian Plane, -1 if it is an ellipse that is not a circle when graphed on the Cartesian Plane, and -2 if the equation is a parabola when graphed on the Cartesian Plane, and -5 if the equation is not a conic. If an equation E_1 is equivalent to another equation E_2 at infinitely many values of x and y, and E_2 is a conic, than consider E_1 to be the same conic.

Let A be the value of the equation $(x-2)^2-(y+5)=5$

Let B be the value of the equation $(y+7)^2-x^2=11$

Let C be the value of the equation $y^2=y+2$

Let D be the value of the equation $\frac{x}{y}=\frac{y}{x}+\frac{2011}{xy}$[Assume x, y are nonzero]

Find $ABCD$

Question 5

A: $\log_{49} 343\sqrt{7}$

B: $(\log 3)(\log_{27} B) = 2$

C: $\frac{\ln 9}{\ln 3}$

Find $\log_{10} B^{AC}$

Question 6

A: The domain of $a(x) = \sqrt{\dfrac{1}{\ln(x+1)}}$.

B: The domain of $b(x) = \dfrac{1}{x^2 - 2x + 3}$.

C: The domain of $c(x) = \sqrt{3x - 2}$.

D: The domain of $d(x) = x^2 + 2x + 2011\sqrt{2011 + 2011\sqrt{2011}}$.

Find the intersection of A, B, C, D in interval notation.

Question 7

Let $f(x) = x^3 + 1, g(x) = \sqrt{x}$, and $h(x) = 3x - 2$

$A =$ The value of $f(h(2))$.

$B =$ The minimum value of x in the domain of $g(f(x))$.

$C =$ The value of $g(f(1))$.

$D =$ The value of $g(f(h(3)))$.

Find A+B+CD

Question 8

A: The value of $\begin{vmatrix} 5 & 2 & 1 \\ -1 & 6 & -2 \\ 2 & 2 & 0 \end{vmatrix}$

B: If $\begin{bmatrix} 2 & 4 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} 1 & -1 \\ 6 & 2 \end{bmatrix} = E$,

B is the value of the determinant of matrix E.

Find $A + B$

Question 9

A solid known as an elliptical cylinder, is simply a standard cylinder with ellipses instead of circles as bases.

A: The volume of an elliptical cylinder with height 5, minor axis of the bases 4, and major axis of the bases 6

B: The surface area of an elliptical cylinder with height 2, minor axis of the bases 4, and major axis of the bases 8

C: The lateral surface area of an elliptical cylinder with height 2, minor axis of the bases 4, and major axis of the bases 8

D: The volume of a cube with space diagonal 1.

Find $A + B - C + D$

Question 10

A: The product of the positive integral divisors of 432

B: The sum of the positive integral divisors of 432

C: The number of positive integral divisors of 432

D: The greatest common factor of 432 and 234

Find $B + C + D + \log_{432} A$

Question 11

A: Evaluate $|(1+i)^6|$

B: $(1+2i)(2-6i)$

C: $(3+4i)-(6-9i)-(2-29i)+(5i+2)$

D: Evalaute $|3+4i|$

Find the real part of $A+B+C+D$.

Question 12

Mathematicians are interested in sums of the form $S_n = \frac{1}{1^n} + \frac{1}{2^n} + \frac{1}{3^n} + ...$, and we have discovered that $S_2 = \frac{\pi^2}{6}$, as well the explicit forms for S_n when n is a positive even integer.
However, nobody has found the value of any S_n for any odd n. But it is possible to compute the following sum

$$x = \sum_{n=2}^{\infty} (S_n - 1)$$

Evaluate x. (Hint: Add the series by rows and add down in columns)

Question 13

If, for a function $f(x)$ such that $f(7) = f^{-1}(7)$, compute

$$10 - f(f(f(f(f(f(f(f(7)))))))))$$

Question 14

A: If $\dfrac{1}{\dfrac{1}{x}+\dfrac{1}{y}} = \dfrac{x+y}{4}$, and x and y are positive, find $4(x-y)$.

B: The harmonic mean of 4 and 2

C: The geometric mean of 4 and 2

D: The arithmetic mean of 4 and 2

Find $A + BCD$