QUESTION 1

Given:

$$4A + 3B = 7$$
$$A - C = -1$$
$$2C + 3B = 1$$

Find $A + B + C$.

QUESTION 2

Let A be the number of terms in the expansion of $(3x + 4y)^4$

Let D be the coefficient of ab^3 in the expansion of $(7a + b)^4$

Let I be the sum of the coefficients of the terms in the expansion of $(x - 4y)^5$

Find $\dfrac{ADI}{81}$.

QUESTION 3

Consider the following polynomial

$$5x^5 + 164x^3 + 15x^2 - 4x + 619.$$

Let A be the product of the roots

Let B be the sum of the roots

Let C be the sum of the roots taken two at a time

Let D be the sum of the roots taken four at a time

Find ABC^2D.

QUESTION 4

A comet is traveling around Earth in an elliptical pattern with Earth being one of the foci. The comet always follows the elliptical pattern. The equation of the elliptical pattern is given as follows:

$$\frac{x^2}{25} + \frac{y^2}{169} = 1$$

Let (X, Y) be the coordinates of the Earth, given that it is the focus with the greatest ordinate

Let A be the area bounded by the path of the comet in square miles, given that it is traveling in a two dimensional space

Let B be the shortest distance the comet will ever be from Earth

Let C be the farthest distance the comet will ever be from Earth

Find $\frac{XY^2}{12} + \frac{A}{BC}$ in simplest form.

QUESTION 5

While hiking in a forest, Aditya came upon some logs that were blocking his way! Help him by solving these logarithms.

$A = \left(\log_{\frac{1}{3}} 81\right)(\log_{128} 4)$

$B = \left(\log_{81} \dfrac{125}{216}\right)\left(\log_{\frac{5}{6}} 729\right)$

$C = (\log_{116} 1)(\log_{16} 96)$

$D = (\log_{64} 343)(\log_{7} 128)$

Find $A + B + C + D$.

QUESTION 6

On the Argand plane, you are traveling from the origin to the point $13 + 84i$. All units are in miles.

Given that you travel at a speed of 5 miles per hour, find the following:

A = the distance you must travel in miles
B = the number of hours it will take you to reach your destination

A fly is also traveling between you and your destination. Once the fly reaches one of the points, it immediately turns around and keeps flying to the other point. The fly continues to fly until you reach your destination. Given that the fly travels at a speed of 8 miles per hour, find the following:

C = the distance the fly will travel in miles
D = the number of hours the fly will travel

Find $A + B + C + D$.

QUESTION 7

Let A be the eccentricity of the conic section with the equation $\frac{x^2}{4} - \frac{(y-3)^2}{3} = 1$

Let B be the length of the latus rectum of the conic section with the equation $\frac{(x-5)^2}{12} + \frac{(y-4)^2}{6} = 1$

Hint: The latus rectum $= \frac{2b^2}{a}$ where 2b is the length of the minor axis and 2a is the length of the major axis.

Let $x = C$ be the directrix of the parabola with the equation $x = y^2 - 2y + 6$

Let $D\pi$ be the area bounded by the graph of $(x-2)^2 + (y-8)^2 = 128$

Find $8A + B - 8C + D$.

QUESTION 8

Let $f(x) = 5x + 5$, $g(x) = \dfrac{3x + 14}{5}$, and $h(x) = 8x$

$f^{-1}(x)$ can be written in the form $Ax + B$

$h^{-1}(g(6))$ is equal to C

The x-intercept of $g^{-1}(x)$ is the point $(D, 0)$

Find $ABC^{-1}D$.

QUESTION 9

Given the following rational function:

$$f(x) = \frac{2x^2 + 6x - 36)}{(x^2 + 9x + 18)}$$

Let A be the sum of the x-coordinates of all possible vertical asymptotes of $f(x)$. If no asymptotes exist, the sum is 0.

Let B be the sum of the y-coordinates of all possible horizontal asymptotes of $f(x)$. If no asymptotes exist, the sum is 0.

Let C be the sum of the coordinates of all discontinuities in the graph of $f(x)$. If no discontinuities exist, the sum is 0.

Find $A - B + C^2$.

QUESTION 10

Let A be the area of the figure bounded by the graph of $|4x| + |3y| = 12$

Let B equal the number of distinct arrangments of the letters in the word JAMESRICK

X is inversely proportional to the square of Y and directly proportional with the cube of Z. When Z is 2 and Y is 6, X is 6. Let C be the value of Z^3 when X is 18 and Y is 27.

Find $A + B + C$.

QUESTION 11

A ball is dropped from a height of 400 meters. After each bounce, it rebounds to a height of $\frac{4}{5}$ of its previous height. Let J equal the total distance the ball will travel if it travels for an infinite amount of time.

Let B equal the determinant of $\begin{bmatrix} -6 & 4 \\ 5 & -3 \end{bmatrix}$.

Let C equal $\sum_{x=0}^{2873} i^x$, where $i = \sqrt{-1}$.

Find $J + B + C$.

QUESTION 12

Aditya and 8 more of his friends are sitting at an IT department board meeting. While Aditya is explaining how to solve a problem with the network, the other 8 argue over how many different ways they can sit around their circular table. Let M equal the number of ways they can sit around the circular table.

Let I equal $6(\vartheta)9$ where $a(\vartheta)b = 3ab^2 + ab$

$\sum_{x=1}^{8}(3x+5)$ is equal to E.

Find $M + I + E$

QUESTION 13

Let J be the real component in the expansion of $(i-2)^4$

Let A be the value such that $\log_4(A^2+2A+2)=0$

Let S be the remainder when $3x^3-2x^2-48x+35$ is divided by $3x-2$

Find $\dfrac{AS}{J}$

QUESTION 14

Begin with 0. Add 1 if the equation represents a parabola, 2 if it represents a non-circular ellipse, 3 if it represents a hyperbola, 4 if it represents a circle, and 5 if it represents a point.

$$y = x^2 + 2x - 8$$
$$\frac{x^2}{25} + \frac{y^2}{9} = 1$$
$$9x^2 - 4y^2 - 18x + 32y - 91 = 0$$
$$x^2 + 9y^2 - 4x - 72y + 139 = 0$$

What is the final value?