Question 1) Find the positive value for y, if:

$$x=\sqrt{12-\sqrt{12-\sqrt{12-\sqrt{12-\ldots}}}}$$

$$y=x\sqrt{8+x\sqrt{8+x\sqrt{8+x\ldots}}}$$

Question 2) Find the simplest form for the following expression for all values of x which the expression is defined.

$$\frac{x^2+3x+2}{x^2-x-2}\bullet\frac{x^3-25x}{x^2-2x-35}\bullet\frac{2x^2-3x-2}{x^2-5x}\div\frac{2x^2+5x+2}{x^2-49}$$

Question 3) Find the sum of the slopes of the asymptote lines for the following conic section: $7x^2-6y^2-28x-84y-308=0$

Question 4) Find the value of w:

$$\log_3(x+5)+\log_3(x-2)=\log_3 18$$

$$2^{16y}=x^{10y-12}$$

w = xy^x

Question 5) Using Cramer's Rule, find $\frac{D_x}{D_y}$ for the following system: $\begin{cases}2x-4y+3z=3\\5x-z+2y=4\\4x-3y+2z=5\end{cases}$

Question 6) Let the equation of the conic section with the center (-7, 2), minor axis of length 6 and parallel to the x-axis, and an eccentricity with the ratio of one over two be defined as $\frac{(x-h)^2}{b^2}+\frac{(y-k)^2}{a^2}=1.$

Find the product of (h + k)(a + m), where m is the distance between the foci.

Question 7) Let A, B, and C represent three consecutive terms for the expansion of $(2x-y)^{12}$, respectively. B is the middle term of the expansion. Find the sum of the coefficients for these three terms.

Question 8) Let $f(x)=3x^{15}-7x^{14}+6x-14.$

Find (A + B + C + D) in lowest terms, if:

A = The sum of the real roots of f(x).

B = The sum of all roots of f(x).

C = The product of all of the roots of f(x).

D = The greatest positive real solution of f(x).

Question 9) Simplify the following and express as one fraction with positive exponents where $x, y, \& z \neq 0$.

$$\left(\frac{2x^5y}{3xy^4}\right)^{-4}\left(\frac{4x^{-5}yz^5}{5xy^7z^{-4}}\right)^3 \div \left(\frac{3xyz}{4x^{-5}z^5}\right)^{-3}$$

Question 10) Let $f(x)=\frac{(x-4)^2}{16}+\frac{y^2}{9}$, $g(x)=\frac{x^2}{4}-\frac{(y+3)^2}{20}$,

f(x) = g(x) = 1 . Find (A + B)(C + D), if:

A = The y coordinate of a focus of f(x).

B = The length of the conjugate axis of g(x).

C = The focal length of g(x).

D = The sum of the x coordinates of the endpoints of the minor axis of f(x).

Question 11) Solve for all values for x which make the following inequality true:

$\frac{4-x}{2+x} > 5x-3$. Answer must be given in interval notation (See below).

Ex: If 9 < y < 11, then the answer for y would be (9, 11).

Question 12) Let 4x - 3y = 5 be line MAO:

Find A + B + C + D, rounded to the nearest hundredths, if:

A = The slope of MAO.

B = The y-intercept of a line which is parallel to MAO and contains the point (ln2, 5).

C = The y-intercept of MAO

D = The y-intercept of a line perpendicular to MAO that contains the point (π, e).

Question 13) A circle has points (4, 3), (6, -5), and (6, 3) as points on the circle. The equation of the line tangent to the circle at the point (4, 3) can be put in the form of Ax + By = C, where A, B, and C are integers. Find the ratio of C over B.

Question 14) Find the area of a triangle containing these 3 points, (1, 2), (-3, 4), and (6, 8).

Question 15) Find $\frac{AB}{CD}$, if:

A = The largest of the 3 consecutive positive even integers which together have a sum of 6006.

B = The number of digits in the product of $3^{2003} \bullet 4^{2004}$.

C= The sum of all of the solutions of:

$$7x^{2004} - 14028x^{2003} - 2003x + 2004 = 0.$$

D= The number of positive integral factors of 120.