1. Calculate the value of the expression \( \sqrt{\frac{x}{x+y} + \frac{y}{x-y}} \) for \( x = 1,1 \) and \( y = 3,14 \).

2. Calculate \( \left( \frac{\sqrt{5}+5i}{4+2\sqrt{3}i} \right)^{2011} \).

3. Find the standard form of the polynomial \( (x-1)^2 + (x-3)^3 \).

4. Factor the polynomial \( x^8 + 1 \) into irreducible factors with real coefficients.

5. Find the partial fraction decomposition of the rational function
\[
\frac{18x^5 + 19x^4 + 37x^3 + 166x^2 - 90x + 270}{x^6 + 2x^5 + 2x^4 + 25x^3 - 36x^2 + 78x - 72}.
\]

6. Solve the inequality \( x + 2 \geq \sqrt{x+4} \).

7. Solve in complex numbers the equation
\[
\begin{vmatrix}
1 & 2 & 2 & 1 \\
-1 & x & 0 & 0 \\
0 & -1 & x & 0 \\
0 & 0 & -1 & x \\
\end{vmatrix} = 0.
\]

8. Solve the equation \( X A = B \) if \( A = \begin{pmatrix} 1 & 3 & -5 \\ 8 & 6 & 9 \\ 3 & -1 & 4 \end{pmatrix} \) and \( B = \begin{pmatrix} 3 & 2 & -9 \\ 1 & 6 & 4 \\ 7 & 4 & -7 \end{pmatrix} \).

9. Solve the equation \( X^2 = A \) if \( A = \begin{pmatrix} 13 & 9 \\ 12 & 16 \end{pmatrix} \).

10. Solve the system
\[
\begin{align*}
3x_1 - 3x_2 - x_3 - 4x_4 &= 26 \\
2x_1 + 7x_2 + 6x_3 + 15x_4 &= -5 \\
3x_1 - x_2 + 2x_3 + 6x_4 &= 18
\end{align*}
\]

11. Find the area of the triangle \( ABC \) if \( A(45,28), B(23,92) \) and \( C(11,13) \).

12. Find the coordinates of the intersection point of the line \( g: \frac{x-1}{1} = \frac{y+2}{6} = \frac{z-7}{8} \)
and the plane \( \alpha: x + 2y + 3z + 4 = 0 \).

13. Find the intersection points of the ellipse \( \frac{x^2}{4} + \frac{y^2}{9} = 1 \) and the parabola \( y = (x+1)^2 \).
14. Find the volume of the triangle pyramid $ABCD$ with vertices $A(1,3,6), B(4,7,2), C(8,1,-2)$ and $D(3,2,7)$.

15. Plot the graph of the quadratic function $f(x)=ax^2+bx+c$, given it passes through the points $A(1,2), B(2,3)$ and $C(5,4)$.

16. Calculate $\lim_{n \to \infty} \frac{n^{2012}-(n-2011)^{2012}}{2012n^{2011}}$.

17. Calculate the third derivative $f''(x) = x^{2012}\ln x$.

18. Find $f'(0)$ given $f(x) = \arctg(\sqrt{1+x} - \sqrt{1-x})$.

19. Find the values of $x$, such that the function $f(x) = 3\sqrt{x-8} + 3\sqrt{x+1}^2$ has a local extreme.

20. Find a function $F(x)$, which is the antiderivative of the function $f(x) = -\frac{1}{x\sqrt{x^2-1}}$ in the interval $(1,\infty)$ and $F(\sqrt{2}) = 0$.

21. Calculate $\int_0^1 \frac{x^4(1-x)^4}{1+x^2} \, dx$.

22. Calculate $\int_0^1 \sqrt{x+1}\sin x^2 \, dx$.

23. Which are the values of $x \in (\sqrt{2},\infty)$ such that the equality $\int_0^1 \frac{dt}{\sqrt{t^2-1}} = \frac{\pi}{12}$ holds.

24. Calculate the area of the figure, defined by the graphs of the functions $y = \sin x$ and $y = \cos 2x$ for $x \in [0,\pi]$.

25. Solve the differential equation $y'' + y = x\sqrt{y}$ with initial condition $y(1) = e$.

26. Calculate the sum $\frac{1}{2} - \frac{2}{3} + \frac{3}{4} - \frac{4}{5} + \cdots + \frac{99}{100}$.

27. Calculate $\lim_{n \to \infty} \frac{\frac{1}{n+1} + \frac{1}{n+2} + \cdots + \frac{1}{2n} - \ln 2}{\frac{1}{n+1} + \frac{1}{n+2} + \cdots + \frac{1}{2n} - \ln 2}$.

28. Solve the equation $2\arctan x + \arcsin \frac{2x}{1+x^2} = \pi$.

29. Find the real roots of the equation $x^3 - 10x^2 + 6 = 0$.

30. For which real values of the real parameter $m$ the equation $x\ln^2 x = m$ has exactly two real roots?

Each problem is worth 2 points.
All numerical calculations must be performed with the expected computing mathematical accuracy for the corresponding computer algebra system.