

ON SOME PROBLEMS OF MATHCAD AND MATLAB APPLICATION TO TRIGONOMETRIC EQUATIONS SOLVING

The aim of this work is to investigate possibilities of engineering calculation software MathCAD and MATLAB for solving of trigonometric equations.

Systems MathCAD and MATLAB are the most powerful resource for engineering calculations, but they have some defects. Applying symbolic calculations in MathCAD and MATLAB for equations solving sometimes we can lose some roots.

Example 1. Solve equation $\cos(3x) + \frac{1}{2} = 0$. Systems MathCAD and MATLAB give solution $\frac{2}{9} \cdot \pi$. But this equation has two roots on the main period. Applying formula for cosine of triple argument $\cos(3x) = 4\cos^3(x) - 3\cos(x)$, we receive equivalent equation $4\cos^3(x) - 3\cos(x) + \frac{1}{2} = 0$. Systems MathCAD and MATLAB for this equation give both roots on main period: $x_1 = \frac{2}{9} \cdot \pi$, $x_2 = \frac{4}{9} \cdot \pi$. We see that all roots on the main period are found.

Example 2. Solve equation $\sin(4x) = \frac{\sqrt{3}}{2}$. Systems MathCAD and MATLAB give solution $\frac{1}{12} \cdot \pi$. But this equation has two roots on the main period. Applying formula for sine of multiple argument $\sin(4x) = 8\cos^3(x) \cdot \sin(x) - 4\cos(x) \cdot \sin(x)$, we receive equivalent equation $8\cos^3(x) \cdot \sin(x) - 4\cos(x) \cdot \sin(x) = \frac{\sqrt{3}}{2}$. Systems MathCAD and MATLAB for this equation give both roots on main period: $x_1 = \frac{1}{12} \cdot \pi$, $x_2 = \frac{1}{6} \cdot \pi$. We see that all roots on the main period are found.

We can note that both packages give the same result, but they do not give full answer and pass some roots. And if we solve given problems applying formulas of multiple argument we'll find all roots.

Conclusion is that application of formulas for multiple arguments allows improving possibilities of considered packages.