Non-linear equations with Mathematica

Solve[] is the most general solver and is designed to analytically solve any equation or system of equations. It will try to find all possible solutions. It works best on algebraic equations. NSolve[] was designed for numerically approximating the roots of multivariate polynomials. FindRoot[] is numerical in nature and is designed to accu rately find one root for each given starting point. It can find a single zero associated with any kind of single nonlinear equation or a simultaneous set of nonlinear equations if it has a good starting point. For a nonlinear system of n differentiable functions, it can form and evaluate the nxn Jacobian matrix and apply Newton's Method.

Function	Definition
`Solve[` *equationlist, variablelist* `]`	Produces the analytic solutions to one or more algebraic equations in one or more variables
`NSolve[` *equationlist, variablelist* `]`	Produces the numeric solutions to one or more polynomials in one or more variables
`FindRoot[` *equationlist, variablestartlist* `]`	Produces a single numeric solution to one or more equations starting with an initial point for each of the variables

Zad1 Znajdź rozwiązania równania $sinx = x^2 - 1$ w przedziale $< -\pi, \pi >$.

Zad2 Rozwiązać równanie $e^{2x} - 2e^x + 1 = 0$

There are three options that control the calculation in FindRoot and other numerical algorithms.

- WorkingPrecision is an option that specifies how many digits of precision should be maintained internally in computation. The default is WorkingPrecision → 16.
- AccuracyGoal is an option that specifies how many significant digits of accuracy are to be obtained. The default is AccuracyGoal → Automatic, which is half the value of WorkingPrecision. AccuracyGoal effectively specifies the absolute error allowed in a numerical procedure.
- PrecisionGoal is an option that specifies how many effective digits of precision should be sought in the final result. The default is PrecisionGoal → Automatic, which is half the value of WorkingPrecision. PrecisionGoal effectively specifies the relative error allowed in a numerical procedure.

Zad3 Rozwiązać równanie $x^2 + x + 1 = 0$

Zad4 Rozwiązać równanie $\mathrm{Cos}[\frac{100}{x}] == \frac{x}{x+1}$ w pobliżu punktu x=5000 z dokładnością do 10 miejsc po przecinku

Zad5 Rozwiązać równanie $e^{-x} = x$. Użyj funkcji EvaluationMonitor aby wydrukować wyniki wyliczeń pośrednich procedury FindRoot.

Zad6 Rozwiązać równanie $e^{-x} = x$. Użyj funkcji EvaluationMonitor aby porównać Metodę Newtona i metodę siecznych.