Excercise 3

1. Equations. Sections 1.5.5–8, 1.6.3. `Solve`, `NSolve`, `Reduce` ja `FindRoot`.
   a) Find the solution of $\cos(x) = x$.
   b) Solve linear system
   $$\begin{aligned} 3x + y &= 2 \\ y + 2z &= 2 \\ x + z &= 1 \end{aligned}$$
   both symbolically and numerically
   c) Solve linear system
   $$\begin{aligned} 3x_1 + x_2 + 4x_3 &= 2 \\ 5x_1 + x_2 + 2x_3 &= 3 \\ x_1 - 3x_2 - 2x_3 &= 1 \end{aligned}$$

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2. Control structures, loops, conditionals, modules: Functions `For`, `Do`, `While`, `If` and `Switch` work almost similar way as same functions in C-language. More information can be found from sections 1.5.6, 1.7.3, 2.6.8–9, 2.7. (skip other functions than mentioned above) You get the syntax of some function by writing name of the function and pressing F1.
   a) Write a function, that get two numbers as an argument and returns the bigger one.
   b) Make function, which takes two argumentsm x:n ja n, and calculates by using `For`-loop the sum
   $$\sum_{k=0}^{n} (-1)^k \frac{x^{2k+1}}{(2k+1)!}$$
   Plot function with n =1...10 and `Sin[x]` in same graph.
   Hint: Use `Module`-commad, Define two local variables, sum index k ja variable in which you can add terms of the sum. In `Module` you can give initial values for the local variables:
   `Module[{k,sum=0},...]`
   Do same function by using `While`.
   c) By using `Switch`, define 10×10-matrix A, which elements are $A_{i,j} = 1$, if $j = i \pm 1$; $A_{i,j} = -2$, if $j = i$; $A_{i,j} = 0 else$

3. **Extra:** Writing documents with Mathematica. Read 1.10.1–6, 8, 10, 12 and 1.1.7 and 1.3.5.