Homework on Wolfram Mathematica 2

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Task1

$M = a_{ij},\ i = 1, 2, 3;\ j = 1, 2, 3$ to calculate determinant, eigenvalues, eigenvectors for the matrix M, where a_{ij} is the random real numbers in range (1, 5)

```
In[•]:= M = Table[RandomInteger[{1, 5}], {x, 3}, {y, 3}];
        M // MatrixForm
```

Out[•]//MatrixForm=

$$\begin{pmatrix} 5 & 4 & 3 \\ 3 & 2 & 2 \\ 1 & 4 & 1 \end{pmatrix}$$

```
In[•]:= Det[M]

Out[•]= -4
```

```
In[•]:= Eigenvalues[M] // N // TableForm
```

Out[•]//TableForm=

```
 8.64081
-1.07245
 0.431646
```

```
In[•]:= Eigenvectors[M] // N // TableForm
```

Out[•]//TableForm=

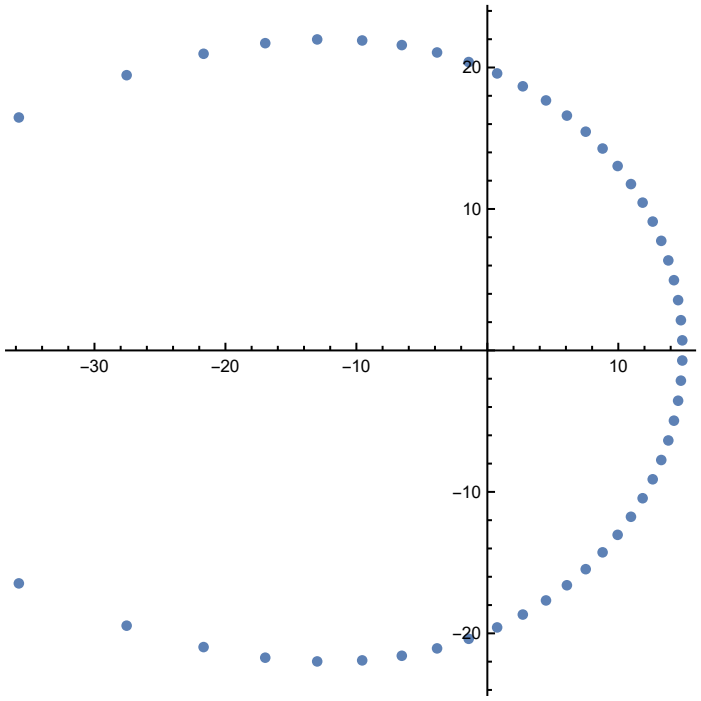
```
 2.29288      1.33698      1.
-0.18286      -0.472398    1.
-0.681448     0.0282734    1.
```

Task 2

Plot all roots of the equation $\sum_{n=0}^{50} \frac{(-1)^{\wedge}n}{n!} x^n = 0$ on the complex plane

In[10]:=
```
f[x_] := Block[{x}, Sum[(-1)^n/n! x^n, {n, 0, 150}] == 0];
roots = x /. Solve[f[x], x] // N;
ListPlot[
 Table[
  {Re[roots][[i]], Im[roots][[i]]}, {i, 0, Length[roots]}],
 AspectRatio → 1]
```

Out[12]=



Task 3

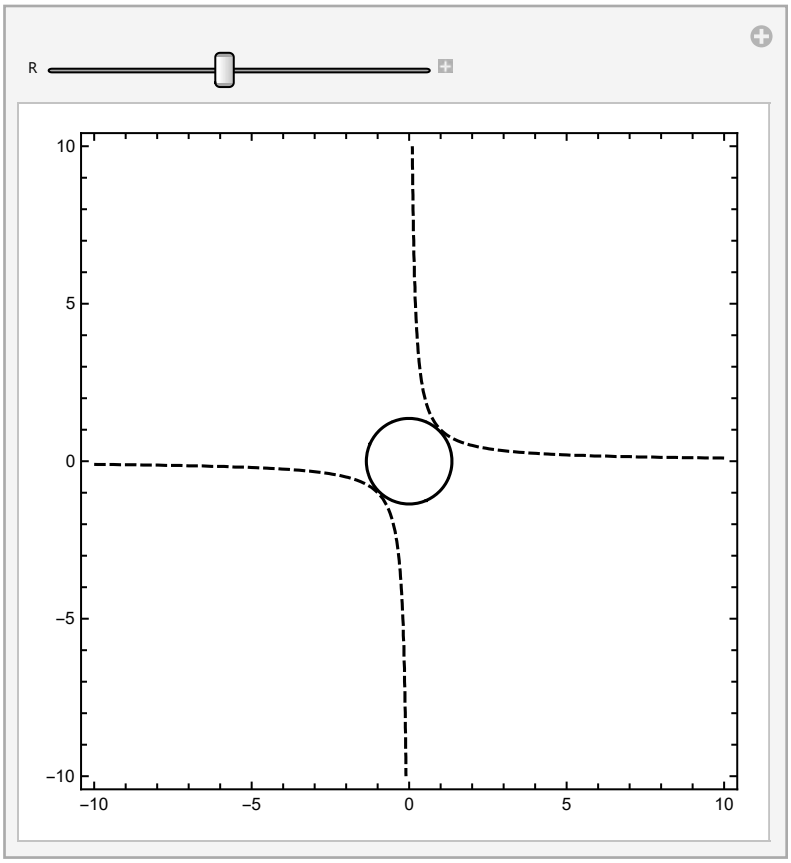
3) Using ContourPlot[] and Manipulate[] to estimate R which corresponds to exactly 2 solution of the following system:

$x\text{^}2 + y\text{^}2 == R\text{^}2;$

$x * y == 1$

In[13]:=
```
Block[
 {x, y, R},
 Manipulate[
  ContourPlot[
   {x^2 + y^2 == R^2, x*y == 1},
   {x, -10, 10},
   {y, -10, 10}],
  {R, 0, 3, 0.01}]]
```

Out[13]=



R approximately equals 1.4