We are used to working with real functions, in which there is one independent variable x, and one dependent variable y; that is, the function that it's represented is a mapping $\mathbb{R}^1 \to \mathbb{R}^1$.

For example, to represent the real function $y = f(x) = x^2 + 2x + 10$, first, the values in which the function is evaluated are defined, by giving some values to the independent variable:

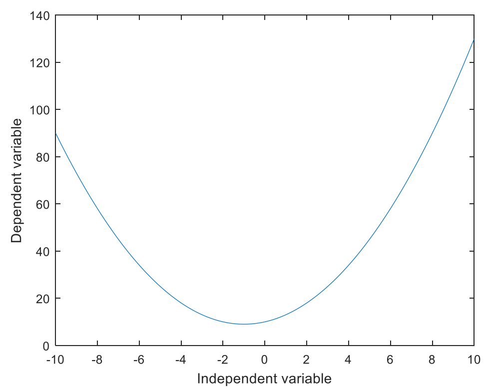
```
xStep=1e-3;
x=-10:xStep:10;%linspace could also be used
```

Then, the value of the dependent variable is obtained at those points, using the period character, if possible:

```
y=x.^2+2*x+10;
```

Finally, the function can directly be represented using the `plot` command:

```
plot(x,y);
xlabel('Independent variable')
ylabel('Dependent variable')
```



However, complex functions are $\mathbb{R}^1 \to \mathbb{R}^2$ mappings, hence, the two-dimensional dependent variable must be represented against the dependent variable in two different plots in order not to lose any information.

For instance, the complex function $z = f(x) = \cos(x) + i\sin(x)$, could be considered as: $z = f(x) = y_1 + i\ y_2 = \cos(x) + i\sin(x)$. Therefore, when representing it, the first two steps are like in the case of real functions:

Firstly, a set of values for the independent variable is defined:

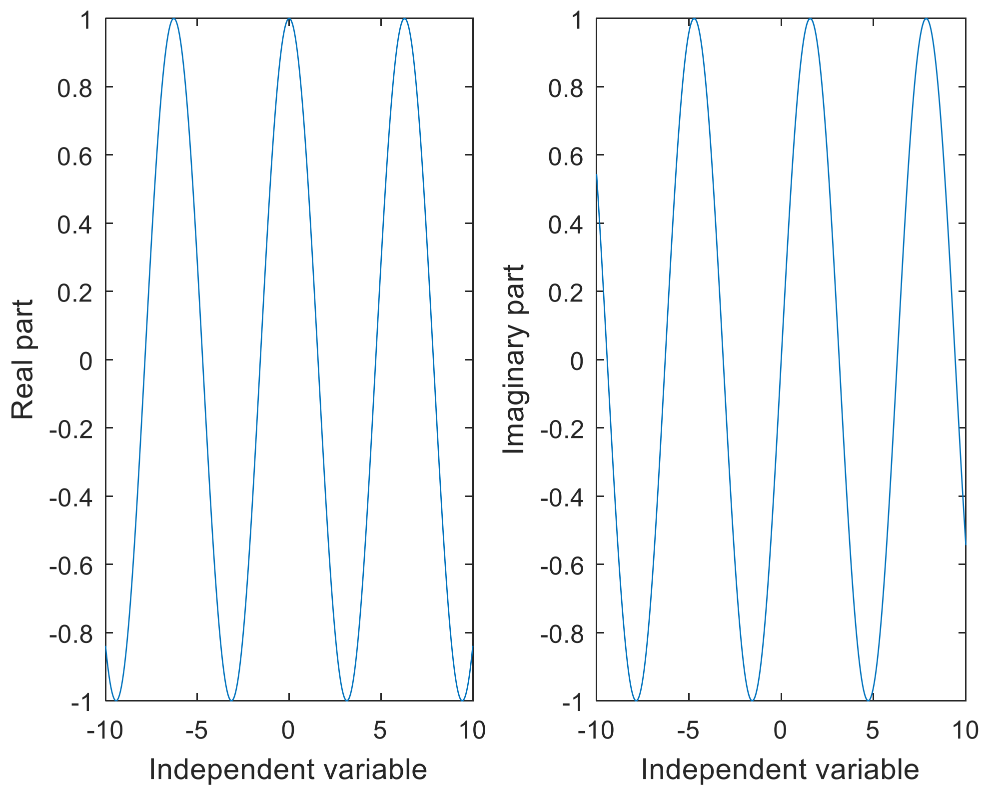
```
xStep=1e-3;
x=-10:xStep:10;%linspace could also be used
```

Secondly, the values of the dependent one are obtained in one go:

```
z=cos(x)+1i*sin(x);
```

Finally, the two dependent variables, must be split and represented:

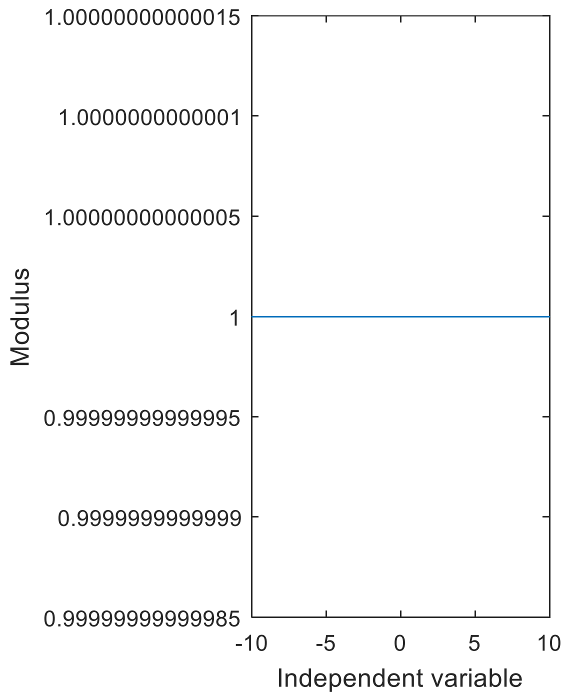
```
plot(x,real(z))
xlabel('Independent variable')
ylabel('Real part')
plot(x,imag(z))
xlabel('Independent variable')
ylabel('Imaginary part')
```

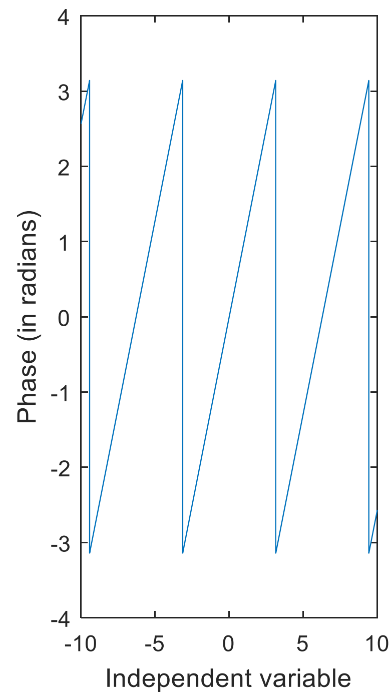


This is one way of representing the two-dimensional dependent variable. However, it is rather difficult to extract some conclusions out of the real and imaginary parts of complex functions since they don't have a very informative theoretical meaning. Consequently, the two-dimensional dependent variable is expressed in terms of two different dependent variables, namely the modulus (i.e. another term for the absolute value) and the phase:

```
plot(x,abs(z))
xlabel('Independent variable')
ylabel('Modulus')
```

```
plot(x,angle(z))
xlabel('Independent variable')
ylabel('Phase (in radians)')
```





For instance, in this case, it is much easier to see that $z = \cos(x) + i\sin(x) = e^{xi}$ (by Euler's formula) since $|e^{xi}| = 1$, but the two pairs of graphs (i.e. real/imaginary part, and modulus/phase) represent the same complex function.