This assignment has 4 tasks.

**Exercises**

**Task 1**

**Integrals**

Compute approximately the integral

\[ \int_0^{\pi/2} \sin(\omega x) \, dx \]

for \( \omega = 2\pi \).

For this end run at the beginning of your program the import statement

```python
from scipy.integrate import quad
```

The method to integrate a function \( f \) over an interval \([a, b]\) is `quad` (quadrature is another word for integrate) and it is used as `quad(f, a, b)`.

It returns a tuple with the approximated solution and the estimated error. Check the help page of that function to see if it has some default arguments which you could set by other values.

**Task 2**

**Integrals and plots** Compute the integral

\[ \int_0^{\pi/2} \sin(\omega x) \, dx \]

for 1000 equidistant values of \( \omega \) in the interval \([0, 2\pi]\) and plot the results versus \( \omega \).

Label the axes and put a title to the plot.
Task 3

Zeros of a function
In a previous training exercise you wrote your own program to find a zero (nollställe) of a given function. Now we see how this can be done by a scipy method.

For this end use first

```python
from scipy.optimize import fsolve
```

The simplest use of the method is `fsolve(f, x0)` where \( f \) is the function of which a zero is calculated and \( x_0 \) is a guess where you expect the zero.

Compute the positive zero of the polynomial \( p(x) = x^2 + x - 3 \).

Task 4

Zeros of a parameter dependent function
Plot the positive zeros of the polynomials \( p(x) = ax^2 + x - 3 \) for \( a \in [1, 5] \) versus \( a \).

Do the zeros depend linearly on \( a \)?