Exercise: Fitting a Wave

In this exercise, you will find the parameters of an unknown equation by solving a system of linear equations.

Task

In this exercise, you will fit a wave by finding the unknown parameters of the equation

$$y = a \ sin(\pi t) + b \ sin(2\pi t) + c \ sin(3\pi t) + d \ sin(4\pi t)$$

using the data:

$$(t_0, y_0) = (0.25, 3)$$

$$(t_1, y_1) = (0.5, 2)$$

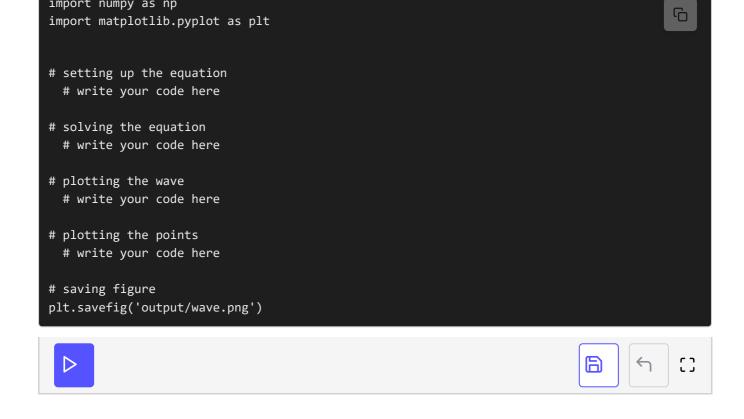$$(t_2, y_2) = (0.75, -3)$$

$$(t_3, y_3) = (1, 0)$$

Problem statement

By substituting the values given above, form a system of four linear equations and solve for the unknown parameters: a, b, c and d

Create a plot of the wave for t going from 0 to 1. Show the four measurements given above with dots. Add legends to your graphs as well.

A basic structure of the code is given to get you started.

```python
import numpy as np
import matplotlib.pyplot as plt


# setting up the equation
  # write your code here

# solving the equation
  # write your code here

# plotting the wave
  # write your code here

# plotting the points
  # write your code here

# saving figure
plt.savefig('output/wave.png')
```

The solution to this exercise will be discussed in the next lesson.