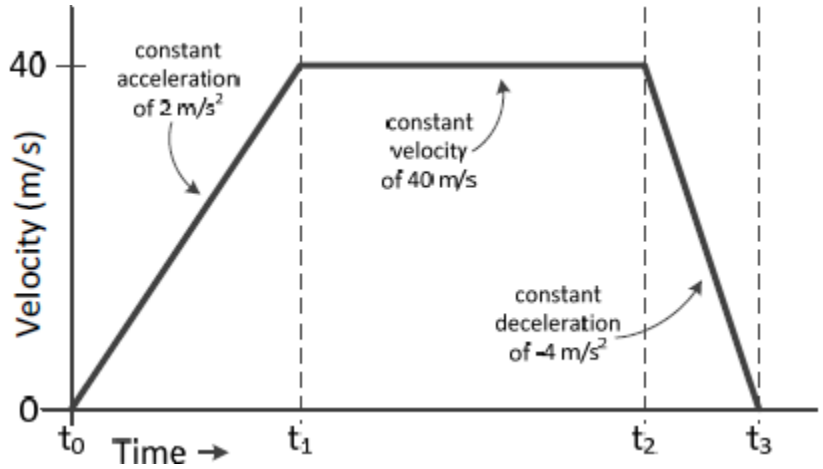
Computer Lab 6 – Week 7

Part 1

Use **while** loops to create arrays of the displacement, velocity, acceleration and time for the following problem. Use a time step of 0.1 seconds.

A car starts at rest and follows the following pattern:

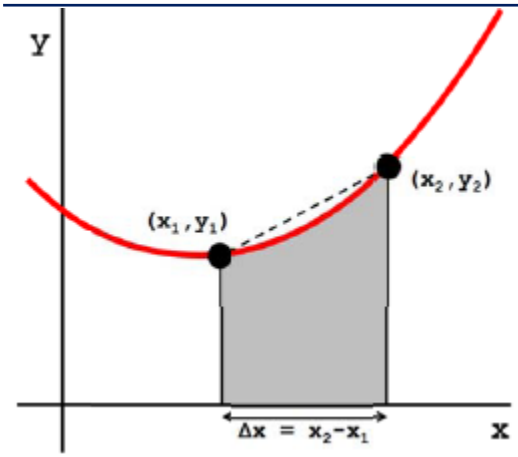
- Constant acceleration 2 m/s^2 until the velocity reaches 40 m/s.
- Then, constant velocity until the displacement reaches 800 m.
- Then, constant deceleration -4 m/s^2 until rest.



Once the arrays are created, use the **plot** function to draw a graph of the displacement, velocity and acceleration over time.

Part 2

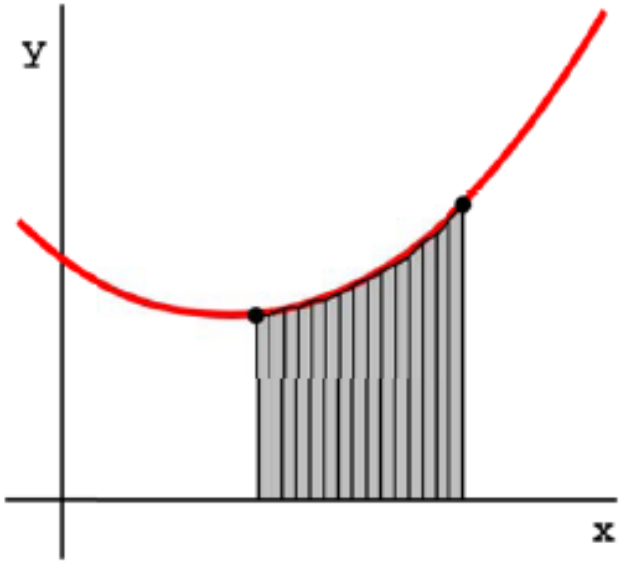
Create a function called **trapArea** that estimates the area under a curve bounded by two points (x_1,y_1) and (x_2,y_2). Estimate the area by computing the area of the trapezium as shown in the below figure.



The function should have four inputs (**x1,y1,x2,y2**) and one output **area**. Test your function to ensure it works as expected.

Part 3

Write a second function **areaUnderCurve** that will call your function **trapArea** several times in a loop. Your new function should have two inputs **x** and **y** which are both 1-D arrays representing the x-axis and y-axis points on a curve. There should be one output: **totalArea**. A visualisation of the application of the function is below.



Use your function to compute the following integrals. Verify the answers.

- $\int_0^3 x^2 dx = 9$
- $\int_{-\pi/2}^{\pi/2} \cos x \, dx = 2$