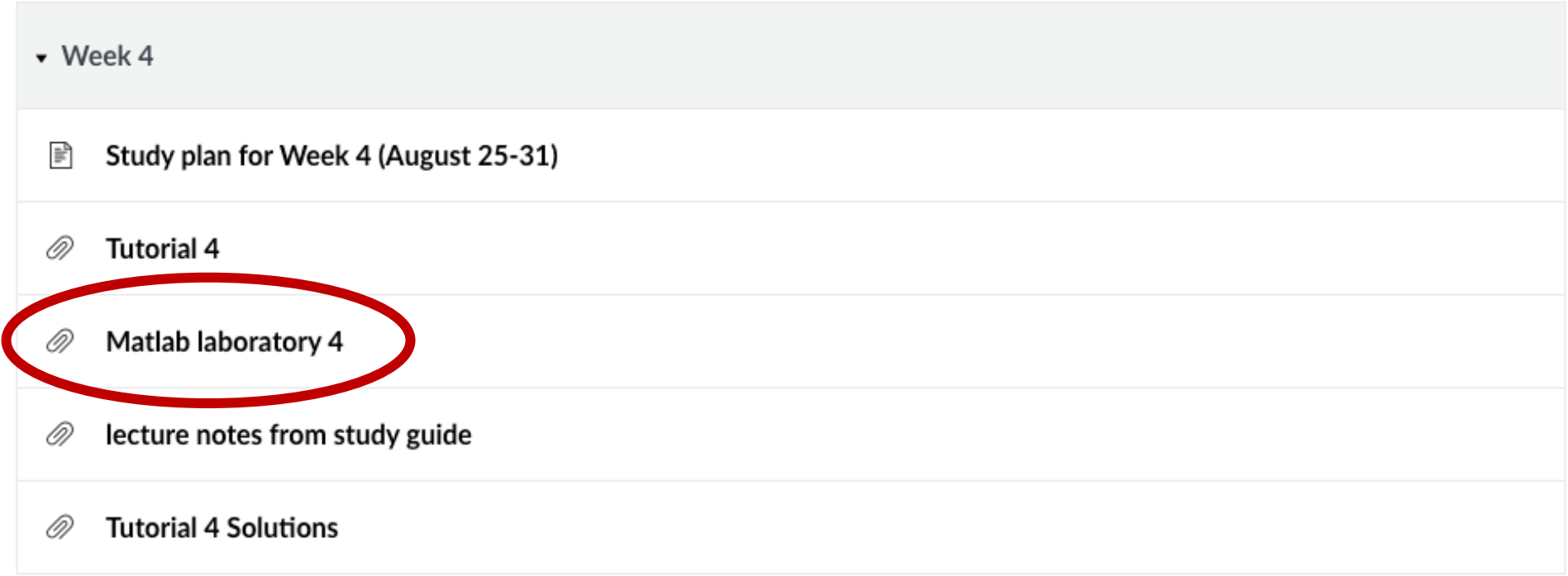
Plan for Week 4 Computer Lab

- Please run through the "**MATLAB Lab 4**" document
- We'll learn how to set up solutions to **differential equation initial value problems** using MATLAB
- **MATLAB Project Part 2**: Please complete the online quiz "Eigenvalue problems and Markov chains" by **29 August** (Friday Week 4). *It's a timed quiz, so don't start this until you have covered the content and have 1 hour spare.*

Lab 4 instructions



By the end of today ensure you can …

Create a function handle in MATLAB

```
>> f = @(t,v)[v(2);(1-
v(1).^2).*v(2)-v(1)];
```

(this returns $\left[\frac{dx}{dt}, \frac{dy}{dt}\right]$ in terms of $v = [x, y]$)

Initialise a coupled differential equation

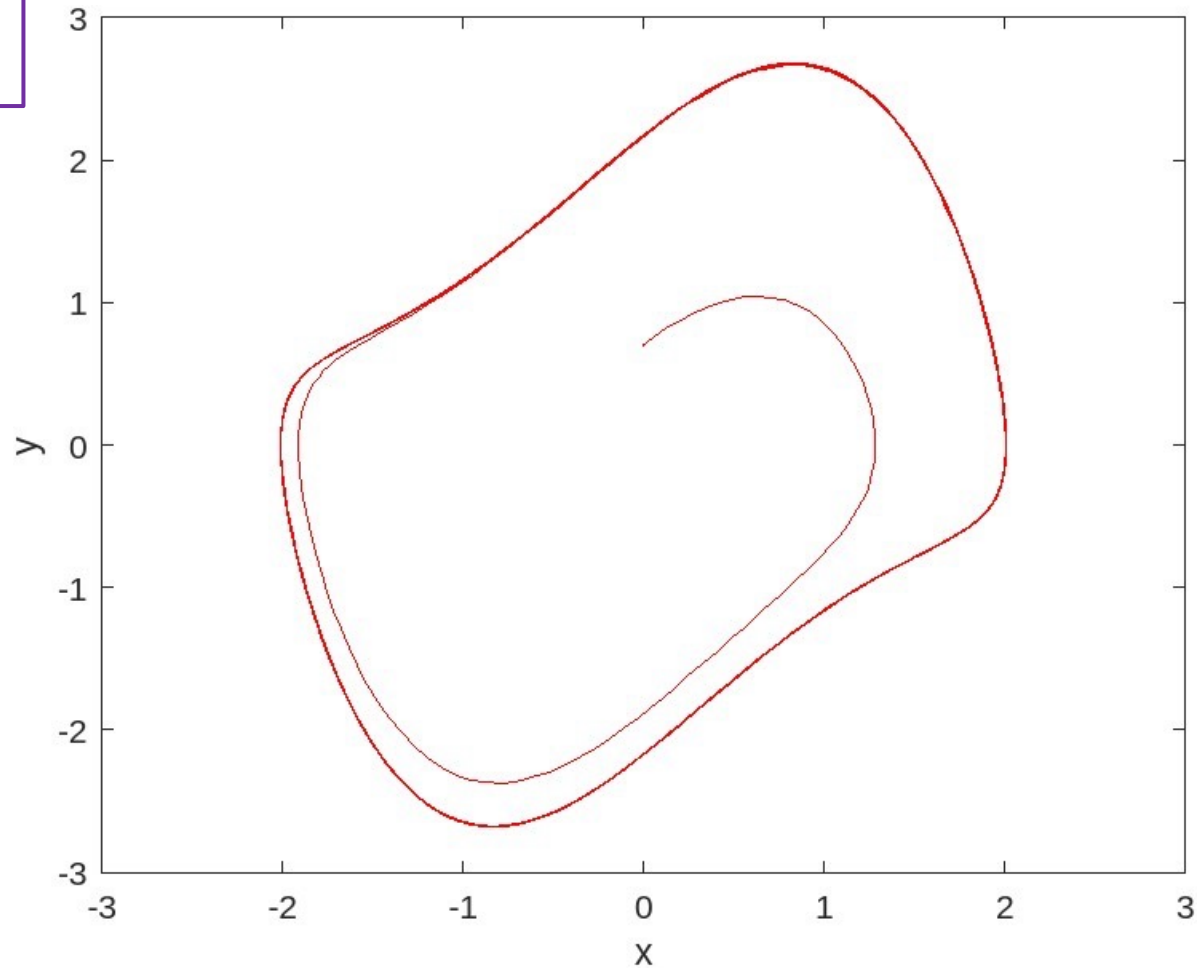
```
>> tspan = [0 100]; (solution span)
>> v0 = [0; 0.7]; (initial conditions)
>> options = odeset('RelTol',1e-
5,'AbsTol',[1e-6 1e-6]);
```

Solve a coupled differential equation

```
>> [T,V] = ode45(f, tspan, v0,
options);
```

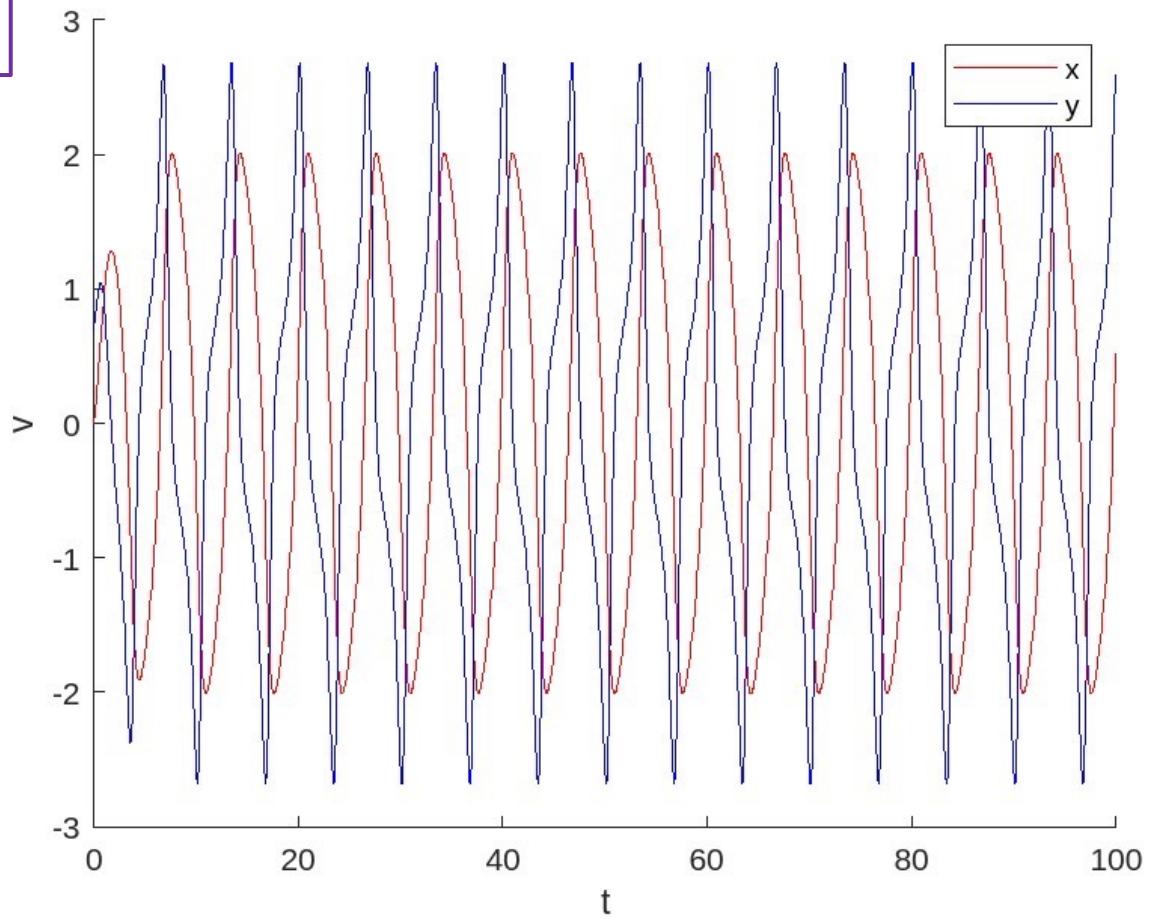
Plots for Lab 4

Plotting x versus y for the "Van der Pol oscillator"



Plots for Lab 4

Plotting x and y versus t for the "Van der Pol oscillator"



Plots for Lab 4

Plotting x versus t for the "damped harmonic oscillator"

$\Omega = \omega_0 = 1$ is the resonance condition