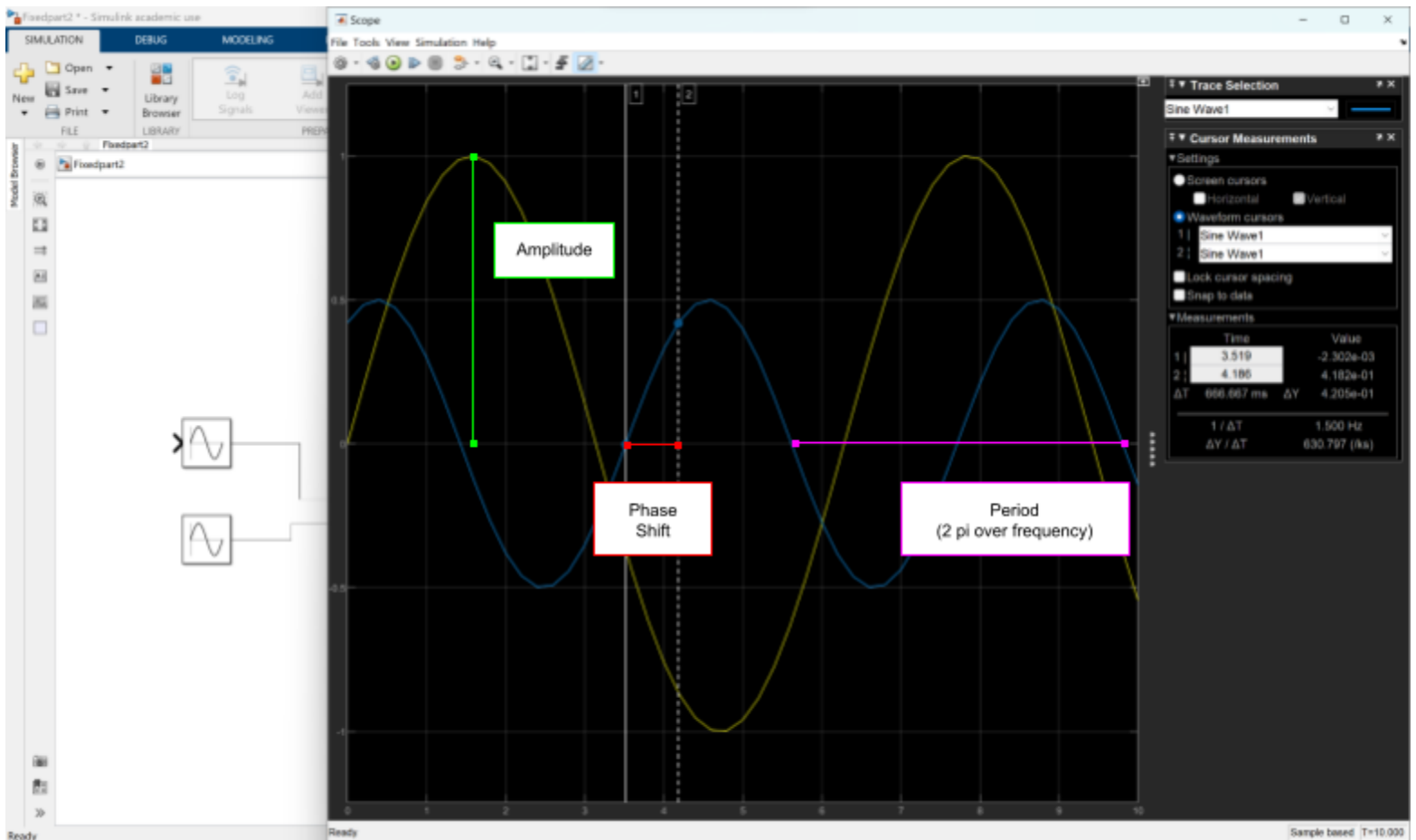# Q3 MATLAB and Simulink Basics
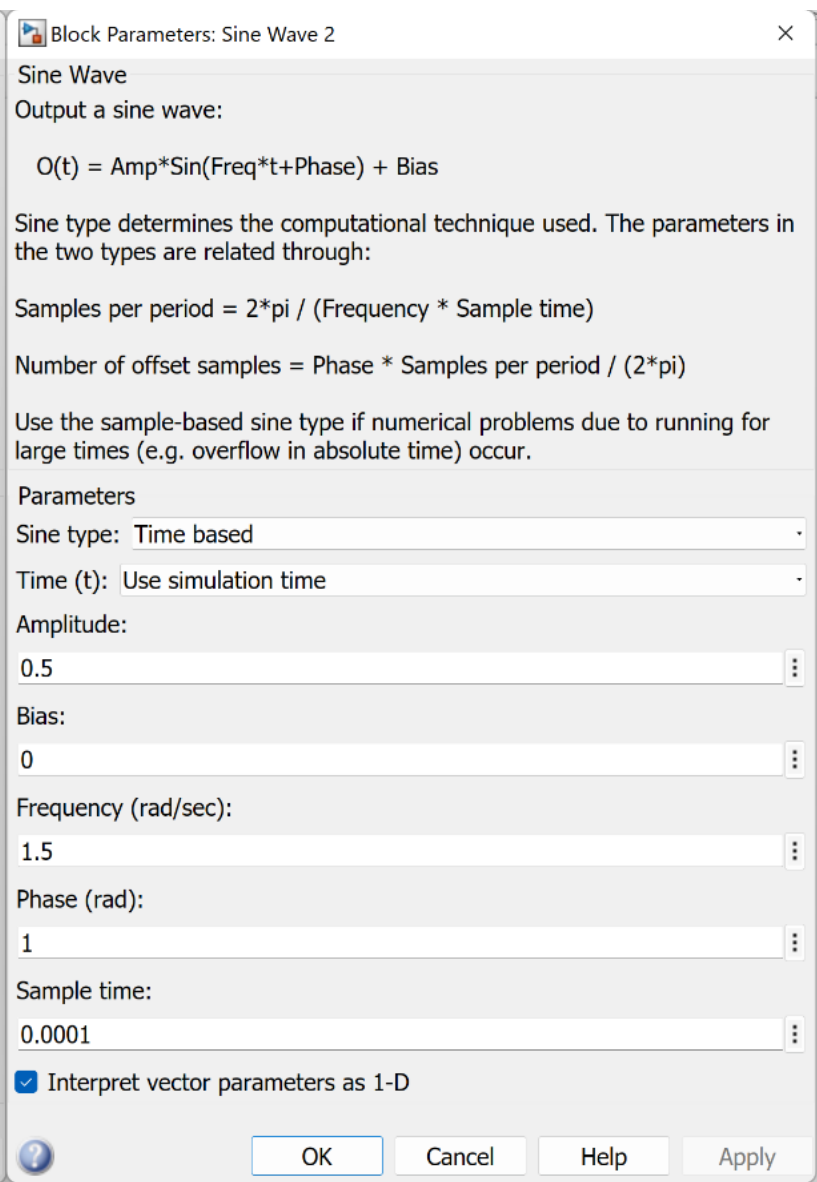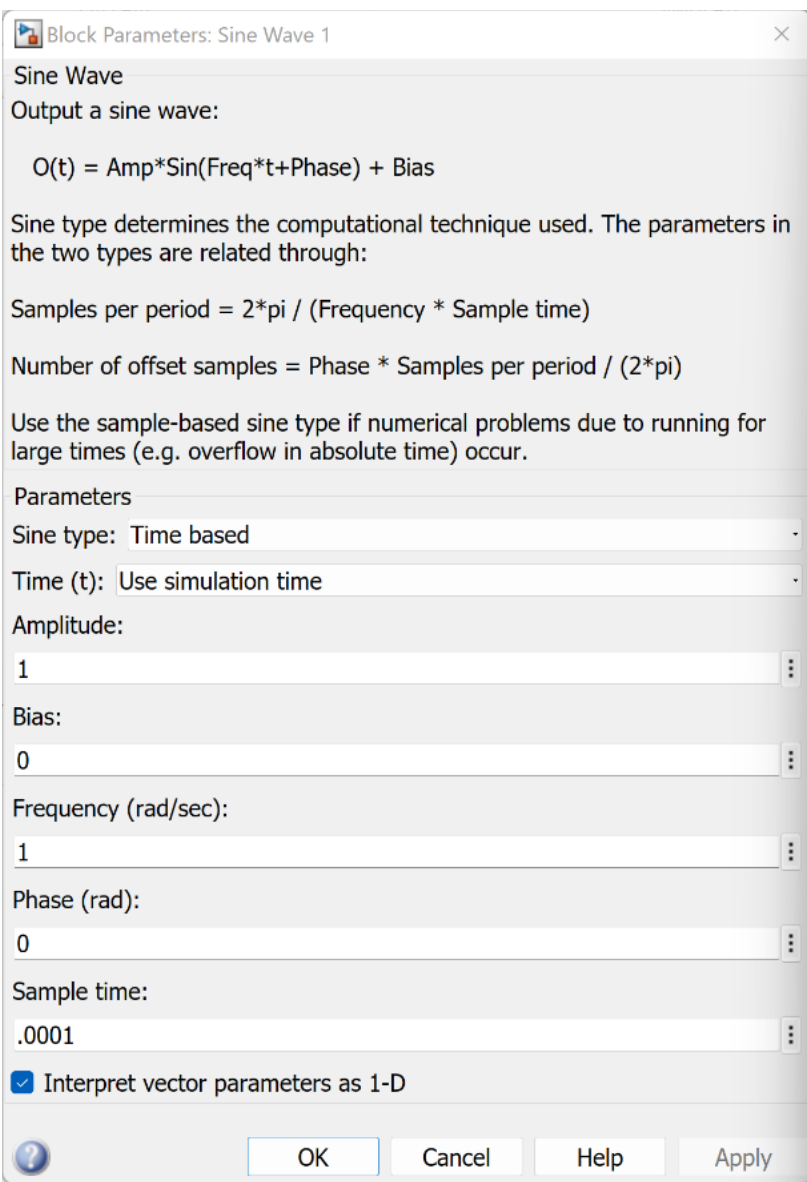
Prove your skill set in using tools for analytical calculations.

Q3.4 Sinusoid definition

I can analytically determine the amplitude, frequency, period and phase shift of a sinusoid. (hint: for phase shift you will need a reference point which could be two different sinusoids plotted together!).

Similar to problem Q3.3 I created two sinusoidal waves, Sine Wave 1 and Sine Wave 2, whose equations are shown below the graph. I then connected their outputs into the scope block which creates a yellow and blue graph, as shown. I then used their equations and the information in the settings (also shown below) in order to determine the values for amplitude, frequency, period, and phase shift.

Block Parameters: Sine Wave 1 ✕

Sine Wave

Output a sine wave:

$$O(t) = Amp*Sin(Freq*t+Phase) + Bias$$

Sine type determines the computational technique used. The parameters in the two types are related through:

Samples per period = 2*pi / (Frequency * Sample time)

Number of offset samples = Phase * Samples per period / (2*pi)

Use the sample-based sine type if numerical problems due to running for large times (e.g. overflow in absolute time) occur.

Parameters

Sine type: Time based

Time (t): Use simulation time

Amplitude:

`1`

Bias:

`0`

Frequency (rad/sec):

`1`

Phase (rad):

`0`

Sample time:

`.0001`

☑ Interpret vector parameters as 1-D

[OK] [Cancel] [Help] [Apply]

Block Parameters: Sine Wave 2 ✕

Sine Wave

Output a sine wave:

$$O(t) = Amp*Sin(Freq*t+Phase) + Bias$$

Sine type determines the computational technique used. The parameters in the two types are related through:

Samples per period = 2*pi / (Frequency * Sample time)

Number of offset samples = Phase * Samples per period / (2*pi)

Use the sample-based sine type if numerical problems due to running for large times (e.g. overflow in absolute time) occur.

Parameters

Sine type: Time based

Time (t): Use simulation time

Amplitude:

`0.5`

Bias:

`0`

Frequency (rad/sec):

`1.5`

Phase (rad):

`1`

Sample time:

`0.0001`

☑ Interpret vector parameters as 1-D

[OK] [Cancel] [Help] [Apply]

Blue Wave: B(t) =1*Sin(1t+0)

Amplitude: 1 unit

Frequency: 1 rad/second

Period(Reciprocal Of Frequency): 2 pi

Phase shift (reference point is the origin (0,0)): 0

Yellow Wave: Y(t) = 0.5*Sin(1.5*t+1)

Amplitude: 0.5 units

Frequency: 1.5 rad/second

Period(Reciprocal Of Frequency): 4/3 pi

Phase shift (reference point is the origin (0,0)): 1