January 21, 2024

Frank Martino - Proof of Skills Analytical Calculations Day 3

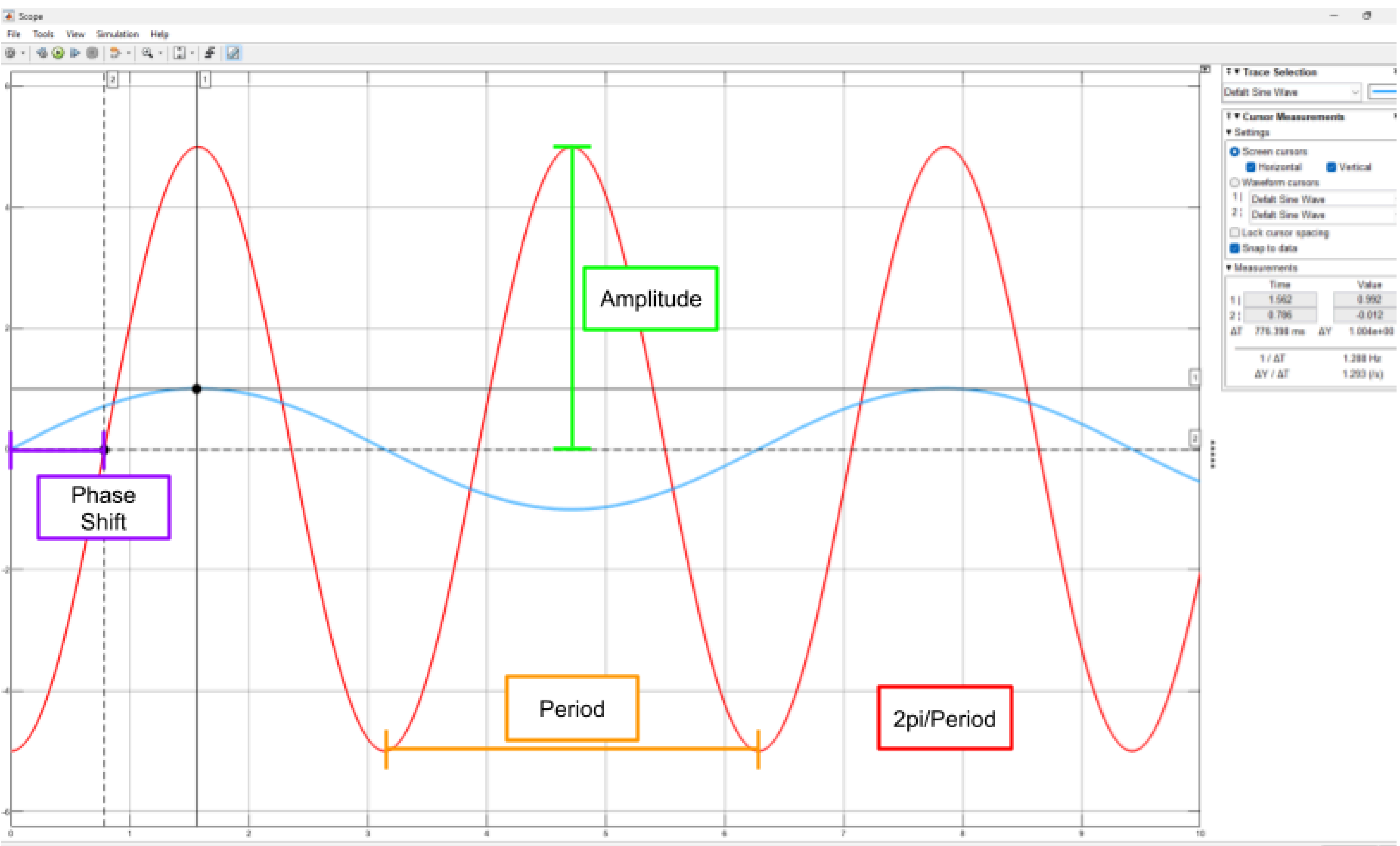
Q3 Analytical Calculations with personal calculator (TI-XX) and MATLAB or equivalent

Prove your skill set in using tools for analytical calculations.

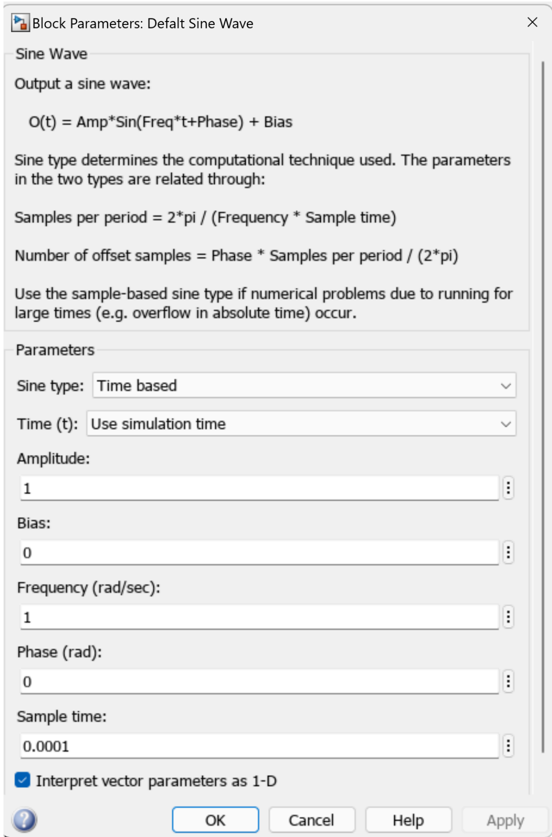
Q3.3 Determine Components of a Sinusoid

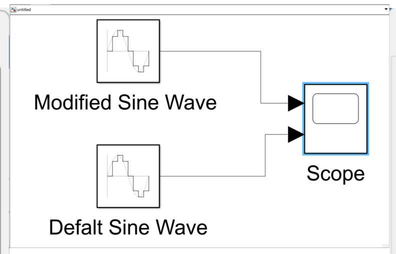
I can analytically determine the amplitude, frequency, period and phase shift of a sinusoid (hint: for phase shift you will need a reference point which could be two different sinusoids plotted together!)

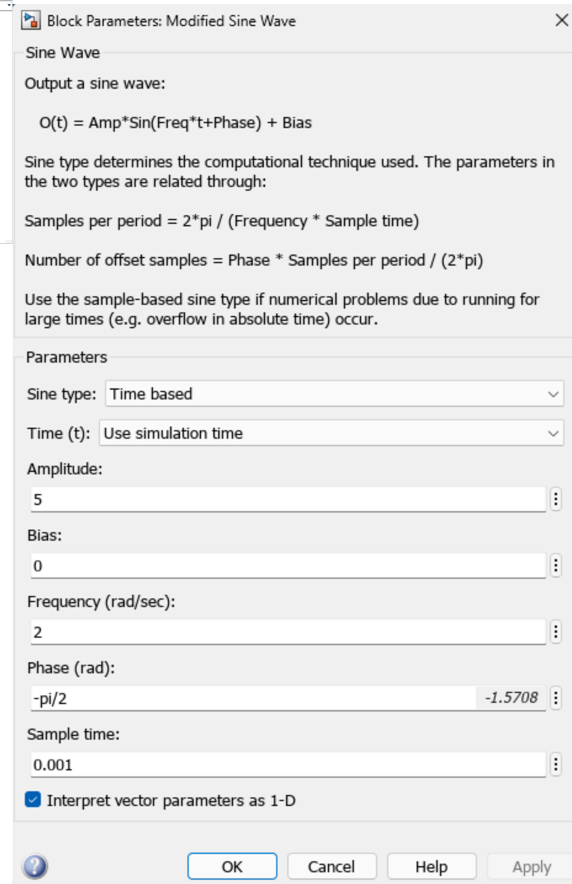
To prove my skills in analytically determining the amplitude, frequency, period, and phase shift of a sinusoid, I first used simulink to create a sine wave. I created two different sine waves one with default values and one modified values in order to make comparing the phase shift easier. The Simulink model and sine wave settings are shown on the next page.



January 21, 2024







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

Amplitude: 1 unit

Frequency: 1 rad/second

Period(Reciprocal Of Frequency*2pi): 2 pi

Phase shift (reference point is the origin (0,0)), formula (phase/frequency) 0/1 = 0 rads

Modified Yellow Wave: Y(t) =5*Sin(2t-pi/2)

Amplitude: 5 units

Frequency: 2 rad/second

Period(Reciprocal Of Frequency*2pi): 1pi

Phase shift (reference point is the origin (0,0)), formula (phase/frequency) (pi/2)/2 = pi/4 rads

We can also look at the graph itself to determine the components of their equations such as the amplitude, frequency, period, and phase shift. For example when looking at the graphs we see that from the center of the blue wave to its peak or minimum is 1 volt and 5 volts for the orange graph. So by definition the amplitudes are 1 volt and 5 volts respectively. While it's difficult to see the frequency in a graph we can use its relationship to the period to calculate it. By looking at the graph we can see that from peak to peak the period of the blue graph is 2pi and the period of the orange graph is shorter, 1 pi. We can then solve for the frequency by taking the reciprocal and multiplying by 2pi to put it in rad/seconds, doing so gets us 1 rad/second for the blue graph and 2 rad/seconds for the orange graph. The phase shift for a positive sinusoidal graph is the distance of the midpoint to the left of the closest peak to the origin which would be 0 rads for the blue graph and 0.776 or ≈ pi/4.