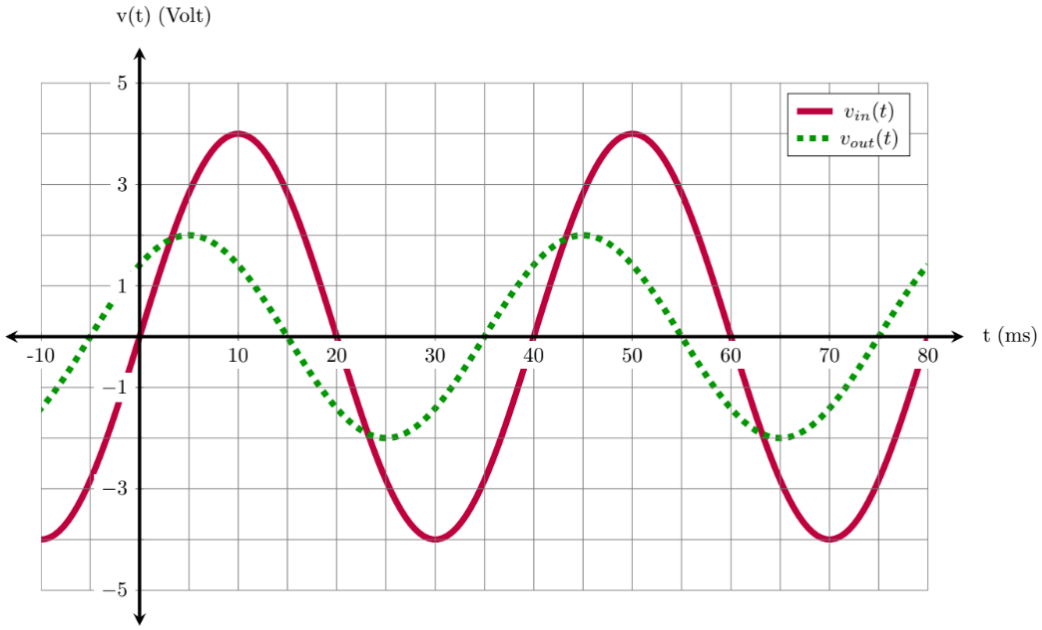
Assignment-2

AC Circuits

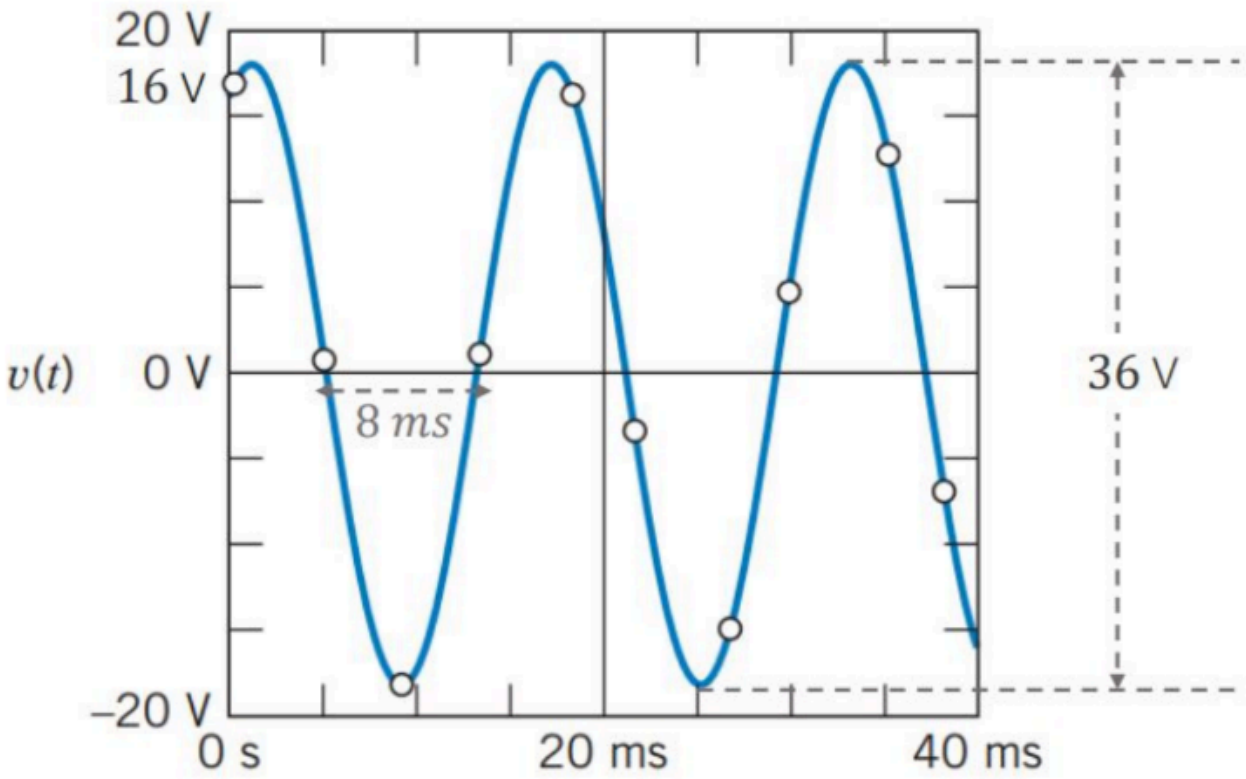
Question 1:

(a) *[4 **marks**]* The input $v_{in}(t)$ and output $v_{out}(t)$ voltage waveforms of a two terminal ac circuit are plotted as a function of time below. **Determine** mathematically the phase difference between the two and specify which one is leading.



Question 2:

The following figure shows a sinusoidal voltage $v(t)$, plotted as a function of time t.



(a) *[2 marks]* **Determine** the parameters listed in the following table with appropriate units††.

Parameter	Value	Unit
Amplitude or peak voltage		
Time period		
Natural frequency		
Angular frequency		

(b) *[3 marks]* Determine the initial phase (in degree units) of the sinusoidal voltage with appropriate ± sign.

(c) *[1 mark]* Write an expression for $v(t)$ of the form $\mathrm{A_m}\ \cos(\omega t + \phi)\ \mathrm{V}$ or $\mathrm{A_m}\ \sin(\omega t + \phi)\ \mathrm{V}$.

Question 3:

For the sinusoidal voltage $v(t)$ and current $i(t)$ expressed as a function of time t below, determine which one is leading and by how much?

$$v(t) = -20\ \sin(25\pi t + 55^\circ)\ V$$
$$i(t) = 4\ \cos(25\pi t - 25^\circ)\ A$$

Question 4:

Which one of the following voltages leads and by how much?

$$v_1(t) = 4\sin(5t - 30^\circ)\ \text{V}$$

$$v_1(t) = -10\cos(5t + 25^\circ)\ \text{V}$$