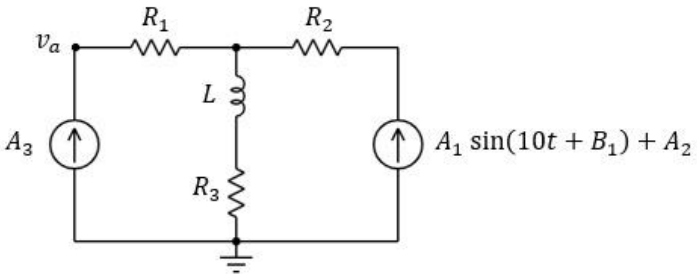
Q1

Find steady state node voltage $v_a(t)$.



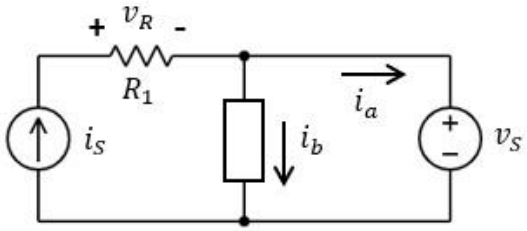
R1: 3 Ω
R2: 2 Ω
R3: 2 Ω
L: 200 mH
A1: 2 A
B1: -20 degrees
A2: 2A
A3: 1 A

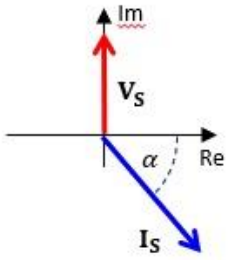
Q2

The AC circuit below has ω = 10 rad/s and is in steady state. The phasor diagram shows the phasors of v_S and i_S. You are given the angle α, $|\mathbf{I_S}|$ and $|\mathbf{V_S}|$. The diagram is not necessarily drawn to scale (but V_S is along the imaginary axis).
The element in the center (rectangular box) is either an inductor or a capacitor but you are not told which.

(a) At what time t_0 does the waveform of v_R reach its maximum value? (if there are multiple such times, giving one of them is sufficient).

(b) We select the mystery element such that $|\mathbf{I_a}|$ is minimized (not $|\mathbf{I_b}|$). What is the mystery element (capacitor or inductor) and what is its value?





|Is|: 2 A
alpha: -30 degrees

|Vs|: 3 V
R1: 3 Ω