$v(t) = 40 \cos(100\pi t + 60°)\ V$

$\omega = 100\pi \Rightarrow f = \frac{\omega}{2\pi} = 50\ Hz$

a) Find max amplitude

$\boxed{V(t) = 40V}$

b) Find Freq in Hz

$\boxed{f = 50\ Hz}$

c) Find Freq in Rad sec

$\boxed{\omega = 100\pi\ Rad/sec}$

d) what is phase angle in radians?

$\theta = 60° = \left(\frac{60}{360°}\right) 2\pi = \boxed{\frac{\pi}{3}\ radians}$

e) what is phase angle in degrees?

$\boxed{\theta = 60°}$

f) what is period in mS? $T = \frac{1}{f} = \frac{1}{50} = \boxed{20\ mS}$

g) what is first time after $t=0$ that $v = -40\ V$

$-40 = 40 \cos(100\pi t + 60°)$ Solving: $\boxed{t = 6.667\ mS}$

h) $V(t)$ is shifted 10/3 ms to the right. what is the new expression for $V(t)$?

10/3 ms is 1/6 of a period = 60°

$V(t) = 40 \cos(100\pi t + 60° - 60°)\ V$

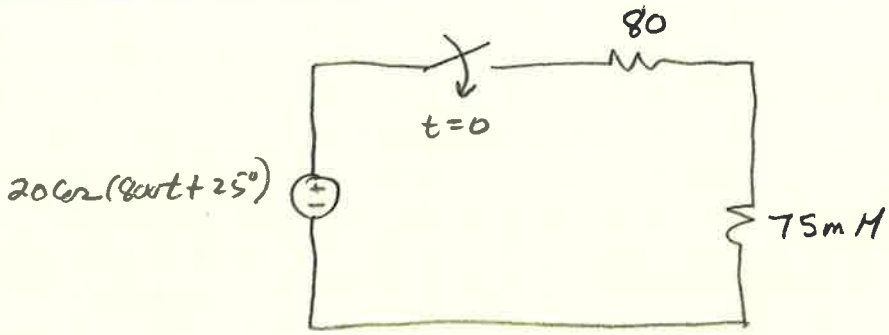
$\boxed{V(t) = 40 \cos(100\pi t)\ V}$

i) what is the minimum number of mS that $V(t)$ must be shifted to the left such that $V(t) = 40 \sin(100\pi t)\ V$?

We $\cos(\omega t) = \sin(\omega t + 90°)$

So $V(t) = 40 \sin(100\pi t + 60° + 90°)$

So we have to shift $-150°$ or $\frac{210}{360}(20ms) = \boxed{11.67\ mS}$



$i_L(0) = 0$

Eq 9.7 page 323:

$$i = \frac{-V_m}{\sqrt{R^2+\omega^2L^2}}\cos(\phi-\theta)e^{-(R/L)t} + \frac{V_m}{\sqrt{R^2+\omega^2L^2}}\cos(\omega t+\phi-\theta)$$

where $\theta = \tan^{-1}\frac{\omega L}{R}$

a) FIND $i(t)$ for $t \geq 0$

from above equation: $V_m = 20$ $R/L = 1066.67$ $\omega L = 60$

$\sqrt{R^2+\omega^2L^2} = 100$

$\phi = 25°$ $\theta = \tan^{-1}\frac{60}{80} = 36.87°$

$$i(t) = \left(-195.72e^{-1066.67t} + 200\cos(800t - 11.87°)\right) mA \quad t \geq 0$$

b) FIND transient + steady state parts

transient : $-195.72e^{-1066.67t}$ mA

SS : $200\cos(800t - 11.87°)$ mA

c) find i @ $t = 1.875$ ms

$i(1.875\text{ ms}) = 28.39$ mA

d) what are maximum amplitude, frequency (Rad/sec) + phase of the SS current?

max amp = 200 mA freq = 800 Rad/s $\theta = -11.87°$

e) By how many degrees are the voltage + SS current out of phase?

phase difference = $25-(-11.87) = 36.87°$

current lags voltage

a 400 Hz sinusoidal voltage with a maximum amplitude of 100 V at t=0 is applied across an inductor. The maximum amplitude of the steady state current is 20 A.

a) what is the Frequency of I_L?

$f_{i_L} = 400$ Hz

b) IF $\theta_V = 0°$, what is θ_I?

The current lags the voltage by 90° so $\theta_i = -90°$

c) what is the inductive reactance of L?

Ind react = $\omega L = (2\pi 400)(L) = \frac{V}{I} = \frac{100}{20}$

$L = 1.99$ mH

Ind react = 5Ω

d) what is L?

$L = 1.99$ mH

e) what is Z_L?

$Z_L = j\omega L = j5\,\Omega$