Problem #1 (25 Points)
The phasor representing the sinusoid $v(t)$ is $v = (1+2j)/(1-3j)$. The angular frequency $\omega$ is 100 radians/sec.

[8 pts.] a) Find the amplitude of the sinusoid.
[8 pts.] b) Find the phase angle of the sinusoid.
[9 pts.] c) Find the first time after $t = 0$ at which $v$ has its maximum value.

Problem #2 (25 Points)

In the above circuit, $V_0 = 10$ V (real, $C = 10^{-8}$ F, $L = 2 \times 10^{-4}$ H, $R = 100$ ohms, $\omega = 10^6$ radians/sec.

[5 pts.] a) Find the numerical value of the phasor $i_C$. Express answer in simplest rectangular form $A + jB$.
[10 pts.] b) Find the numerical value of the phasor $i_L$. Express answer in simplest rectangular form $A + jB$.
[10 pts.] c) Find the time-averaged power produced by the voltage source. (That is, find the power that comes out of the voltage source and goes into the rest of the circuit.)

Problem #3 (25 Points)
For a certain circuit block, the ratio $|V_{\text{out}}|/|V_{\text{in}}|$ is represented by the following:

The general expression for this transfer function is

$|V_{\text{out}}| = (1 + A \omega)^M$
$|V_{\text{in}}| = (B + C \omega)^N$

Find $A, B, C, M$ and $N$. Note: 0 dB corresponds to $|V_{\text{out}}|/|V_{\text{in}}| = 1.$
Problem #4 (25 Points)

Find $V_{out}$ in the above circuit. The diodes are to be represented by the large-signal diode model (including the 0.7 V drop across a forward-biased diode.) Make sure your answer is reasonable and consistent. Explain your reasoning.