Unified Engineering Spring **2008**

Signals and Systems Problem S1 .

Reading: Sections 3.1 and 3.2 in the text

Given that a LTI system is described by the following differential equation

$$\frac{d^2y(t)}{dt^2} + a\frac{dy(t)}{dt} + b\,y(t) = \frac{dx(t)}{dt} + c\,x(t)$$

where *x(t)* is the input and *y(t)* is the output.

i) Assume that *x(t)* is a complex exponential input and that the output *y(t)* is of the form given in equation (3.5) in the text. Substitute for *x(t)* and *y(t)* in the LTI system differential equation.

ii) Perform the indicated differentiations and use your result to determine the complex amplitude factor *H(s),* which is also known as the system transfer function.

iii) Determine the magnitude and angle of *H(s)*, as function of the frequency (ω), when $s = j\omega$.