Department of Electrical and Computer Engineering
The University of Alabama in Huntsville

CPE 381: Fundamentals of Signals and Systems for Computer Engineers

Quiz #3 Solution

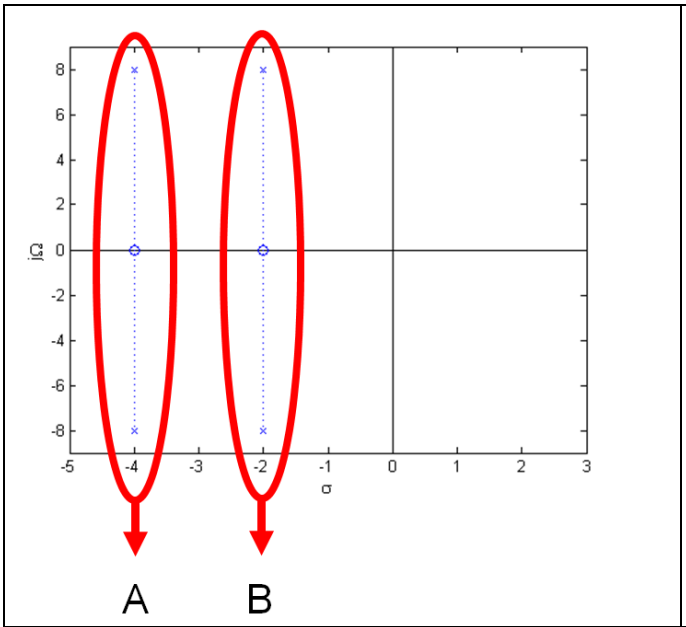
1. What is the Laplace transform $F(s)$ of the function $f(t)$

$$F(s) = \int_{-\infty}^{\infty} f(t)e^{-st}dt \quad s \in ROC$$

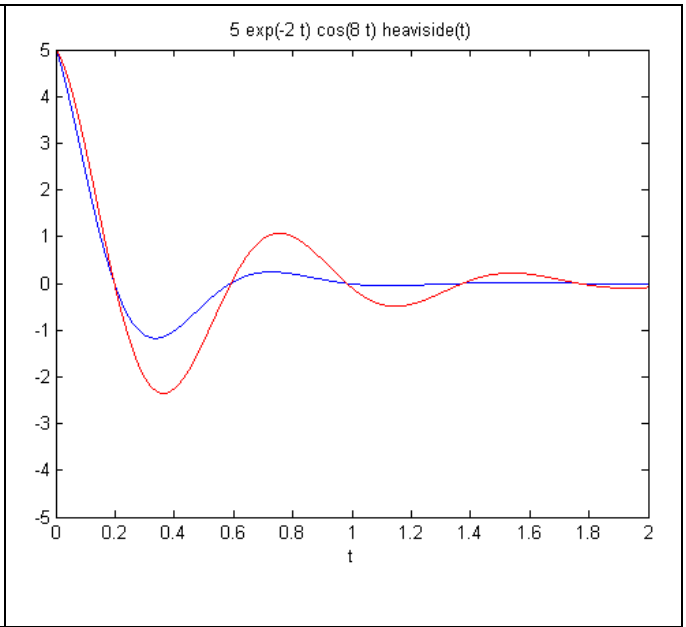
2. What is the Laplace transform $F(s)$ of the function $f(t)$

$$f(t) = \frac{1}{2\pi j}\int_{\sigma-j\infty}^{\sigma+j\infty} F(s)\, e^{st}ds \quad \sigma \in ROC$$

3. (20 points)



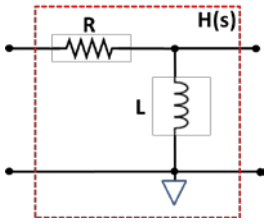
Signals A and B in Laplace domain



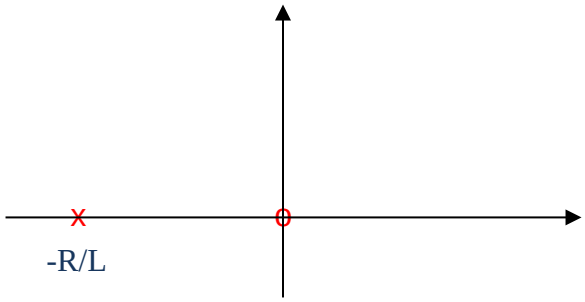
Signals A and B in time domain

Zeros and poles of function **A** are shifted to the left means larger absolute values of σ; consequently, signal **A** in time domain is more attenuated (dumped) than signal **B**.

3. (20 points) What is the transfer function $H(s)$ of the following circuit? Draw zeros in poles in s-plane.



$$H(s) = \frac{Ls}{R+Ls} = \frac{s}{s+\frac{R}{L}}$$



4. (20 points) Provide Laplace transforms of the following functions

a) $\delta(t)$ 1

b) $u(t)$ $\frac{1}{s}$

c) $e^{-t}u(t)$ $\frac{1}{s+1}$

d) $\sin(\Omega_0 t)\,u(t)$ $\frac{\Omega_0}{s^2+{\Omega_0}^2}$

5. (20 points) What is the value of the following sum:

$$\sum_{i=0}^{\infty} e^{-i} =$$

Since

$$\sum_{i=0}^{N} x^i = \frac{1-x^N}{1-x}$$

$$\sum_{i=0}^{\infty} e^{-i} = \frac{1-(e^{-1})^{\infty}}{1-e^{-1}} = \frac{e}{e-1}$$