UNIVERSITY OF TEXAS AT DALLAS
Telecommunications Engineering

TE3302 Signals & Systems
Problem Set #1: Signals, Complex Numbers, and Sinusoids

Date assigned: August 30, 2000
Date due: September 6, 2000

Homework is due at the beginning of class. Late homework will not be accepted.

Reading: Signals & Systems, ch. 1

You may use any computer program to help you solve these problems, check answers, etc.

Problem 1.1 Signals
Problem 1.5 (please prove the answers) and Problem 1.21 ((a),(b),(c),(d)) in Signals & Systems.

Problem 1.2 Periodic Signals
Problem 1.25 ((a),(c)) and Problem 1.26 ((a),(d)) in Signals & Systems

Problem 1.3 Review of Complex Numbers
Evaluate and give the answer in both rectangular and polar form. In all cases, assume that $z_1 = -3 + j4$ and $z_2 = 1 + j$. Note that $z^*$ is the complex conjugate of $z$. Hint: You might consider using Matlab to check your answers.

(a) $z_1^*$  (b) $z_2^2$  (c) $z_1 + z_2^*$
(d) $jz_2$  (e) $z_1^{-1} = 1/z_1$  (f) $z_1/z_2$
(g) exp $z_2$ ($e^{z_2}$)  (h) $z_1 z_1^*$  (i) $z_1 z_2$

Problem 1.4 Using Matlab to Plot Signals
Matlab’s strength is in performing matrix-vector calculations which are convenient for computing signals and test signal processing algorithms. In this problem, we will use Matlab for plotting signals. Submit a hardcopy of the following Matlab plot:

```matlab
J = sqrt(-1);  \%\% imaginary number
dt = 1/100;     \%\% time increment
tt = -1 : dt : 1; \%\% vector [-1, -.99, ..., .99, 1]
Fo = 2;         \%\% frequency
xx = 100 * real(exp(J*(2*pi*Fo*(tt - 0.75))));
subplot(2,1,1);
plot(tt, xx), grid \%\% time-domain plot
title('Section of a sinusoid'), xlabel('time (sec)')
```