

CSE 594 - Homework 1
 Fall 2007
 Due Tuesday, Oct 2 in class

1. Complex numbers:

- a) Plot these numbers into the complex plane: $c_1=6+i5$ and $c_2=9-i3$.
- b) Compute their magnitudes and angles.

For the following exercises, give an indication of your solution and draw the result in a coordinate system, with the axes properly labeled with numbers. No rough free-form sketching.

2. Convolution of continuous signals:

See the figure below. For the solution, do not try to derive (possibly complicated) math. Look for landmark (interesting) locations on the x-axis where the output signal will change slope or continuity and connect these landmark points in a meaningful manner.

- a) Convolve signal (1) with signal (2).
- b) Now shift signal (2) by $x=5$ and convolve it again with signal (1). What is different, what is the same?

3. Convolution of discrete signals:

- a) Draw discrete signal $s_1(x)=4\cdot\Pi(x/4)$ for all $\{x \mid -10 \leq x \leq 10, x \in \mathbb{Z}\}$, i.e., x is an integer in the range $\{-10, 10\}$ and s_1 is a box centered at $x=0$, with amplitude 4 and a total width of 4.
- b) Draw discrete signal s_2 for all $\{x \mid -10 \leq x \leq 10, x \in \mathbb{Z}\}$: $s_2=0$ for all $x < 0$ and $x > 5$, and else $s_2(x)=20\cdot G_{\mu=0, \sigma=2}(x)$, where G is the Gaussian function (see handout), here with mean $\mu=0$, standard deviation $\sigma=2$, and amplitude 20, but only non-zero for positive x less than 5.
- c) Now convolve the two signals and draw the result $s_3(x)$ for $\{x \mid -10 \leq x \leq 10, x \in \mathbb{Z}\}$.
- d) What do you observe, with respect to the original Gaussian of s_2 ?

