ECE 3337, Dr. Hebert, Summer-3 2016 Homework 1, Due thurs 6/9

The 1st three problems introduce you to all the angles that you will be responsible for on tests where you can't use a calculator.

Problem 1.

a) Plot the following 4 points on a single complex plane, labeling each point.

$z_1 = 1 + j0 \qquad z_2 = 0 + j1 \qquad z_3 = -1 + j0 \qquad z_4 = 0 - j1$

b) Find the four magnitudes r_1, r_2, r_3, r_4 and four angles $\theta_1, \theta_2, \theta_3, \theta_4$ of the four points such that $-\pi < \theta_i \le \pi$.

Problem 2.

a) Plot the following 4 points on a single complex plane, labeling each point.

$z_1 = 1 + j1 \qquad z_2 = -1 + j1 \qquad z_3 = -1 - j1 \qquad z_4 = 1 - j1$

b) Find the four magnitudes r_1, r_2, r_3, r_4 and four angles $\theta_1, \theta_2, \theta_3, \theta_4$ of the four points such that $-\pi < \theta_i \le \pi$.

Problem 3.

a) Plot the following 8 points on a single complex plane, labeling each point.

$z_1 = \sqrt{3} + j1 \qquad z_2 = 1 + j\sqrt{3} \qquad z_3 = -1 + j\sqrt{3} \qquad z_4 = -\sqrt{3} + j1$

$z_5 = -\sqrt{3} - j1 \qquad z_6 = -1 - j\sqrt{3} \qquad z_7 = +1 - j\sqrt{3} \qquad z_8 = +\sqrt{3} - j1$

b) Find the eight magnitudes $r_1, r_2, r_3, r_4, r_5, r_6, r_7, r_8$ and eight polar angles $\theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6, \theta_7, \theta_8$ of the four points such that $-\pi < \theta_i \le \pi$.

Problem 4.

(a) $z = \dfrac{-5 + i7}{7 - i5}$ Find the magnitude. $|z|$.

(b) $z = \dfrac{(3 - i2)}{(5 + i4)}$ Find the polar form r, θ of the complex value $z = r[\cos(\theta) + j\sin(\theta)]$.

Problem 5. Showing all work, find all values of z for which

(*a*) $z = \sqrt{1 - i}$ (*b*) $z = \sqrt[3]{1 + i}$

Problem 6. Find all values of z that satisfy $z^2 - (5 + i)z + (8 + i) = 0$

Problem 7.

(a) If $a + jb = \dfrac{\left[(2 + j)^2\right]^*}{3 - j4}$, then $a =$ _____ , $b =$ _____

(b) Find r, θ for the polar form $z = r[\cos(\theta) + j\sin(\theta)]$ of the complex number $z = -3 - j3$

Problem 8. Where $z = x + jy$, separate $f(z)$ into real $\mathrm{Re}\{f(z)\}$ and imaginary $\mathrm{Im}\{f(z)\}$ parts as functions of x, y

a) $f(z) = 2z^2 - i3z$

b) $f(z) = \dfrac{1 - z}{1 + z}$