Math 295 - Fall 2020
Homework 2
Due at 11:59pm on Friday September 18

Please turn in this assignment on Gradescope.

Problem 1 : (Objective A8)

a) Plot the complex numbers $z_1 = 2e^{i\pi/3}$, $z_2 = e^{i\pi/6}$, and $z_1 + z_2$ in the complex plane.

b) Plot the complex numbers $z_1 = 2 + i$, $z_2 = -1 + 2i$, and $z_1 - z_2$ in the complex plane.

c) Plot the complex numbers $z_1 = -\frac{1}{2} + i\frac{\sqrt{3}}{2}$, $z_2 = -\frac{1}{2} - i\frac{\sqrt{3}}{2}$, and $z_1 z_2$ in the complex plane.

Problem 2 : (Objective A9)

a) Sketch the following sets in the complex plane:

   i. $\{z \in \mathbb{C} : |z - 1 + i| < 2\}$ iii. $\{z \in \mathbb{C} : |\operatorname{Im}(z)| > 1\}$

   ii. $\{z \in \mathbb{C} : |z| = |z + 1|\}$

b) Sketch the following contours in the complex plane. On your sketch, label the point(s) where each curve begins and ends, and use an arrow to show the direction in which the contour is traveled as t increases.

   i. $\gamma(t) = e^{\pi i t}, t \in [-1, 1]$ iii. $\gamma(t) = 2t - 1 + it, t \in [0, 1]$

   ii. $\gamma(t) = t + it^2, t \in [-1, 1]$

   Of these three contours, which one(s) are simple? Which one(s) are closed?

Problem 3 : (Objective A10) Give a parametrization for each of the following contours:

a) the circle with center $1 + i$ and radius 1, oriented counter-clockwise

b) the line segment from $-1 - i$ to $2i$

c) the rectangle with vertices $\pm 1 \pm 2i$, oriented clockwise

Problem 4 : (Objectives A11, A12, A13, A14) For each of the sets in problem 2 part a), determine if the set is

a) open, closed, or neither;

b) bounded;

c) connected.

d) Then find all boundary points of the set, and all interior points of the set.