Homework 7
Due 5/30/2019

In Problem $1, 2, 3, 4$, the answers should be in complex standard form $a + ib$.

1. Do Problem 4.35 page 72 of the textbook.
2. Do Problem 5.1 (b) page 80 of the textbook.
3. Do Problem 5.3 (a), (f), (h) page 80 of the textbook.
4. Let γ be a path with parametrization $\gamma(t) = (1-t^2, t)$ where $-2 \le t \le 1$. Compute $\int_\gamma \frac{1}{z^{1/2}} dz$. (Here $z^{1/2}$ is understood by using principal branch of logarithm.)
5. Do Problem 7.25 page 108 of the textbook.

For Part (a) and (b) of Problem 6, you should use Mathematica to sketch graphs. In other parts, you can use Mathematica to assist your arguments. *Make sure to write the Mathematica code you use, give explanation and some comments on the graph.* Similar treatment is done in the supplemental material "**Complex integral via Mathematica**" posted on the course website.

6. Let γ be a curve with parametrization

$$\begin{cases} x(t) = (2 + \sin 7t) \cos t, \\ y(t) = (2 + \sin 7t) \sin t \end{cases} \qquad t \in [0, 2\pi] \, .$$

Consider complex function $f(z) = \cos x + i \sin y$.

(a) Sketch the curve γ.

(b) Sketch the curve γ and the vector field f on the same graph.

(c) What is the Pólya vector field of f (denoted by $\bar{f}$)?

(d) Find an approximation for the complex integral $\int_\gamma \bar{f}(z) dz$.

(e) Find an approximation for the work done by f along γ, and the flux of f across γ.