1 (15 points) Let $\mathcal{C}$ be the oriented line segments joining 0 to $1-2i$. Show that $\left|\int_{\mathcal{C}} z^3 dz\right| \leq 25$.

2 (20 points) Let $\mathcal{C}$ be a differentiable contour and $S := I(\mathcal{C})$, so that $\mathcal{C} = \partial S$. Show that $\oint_{\mathcal{C}} \bar{z} dz = 2iA$ where A is the area of S.

3 (15 points) Let $\{w_n\}$ be a sequence in $\mathbb{C}$ such that $\forall m, n \in \mathbb{N}$, $|w_m - w_n| \leq 2^{-p}$, where p is the minimum of $\{m, n\}$. Show that $\{w_n\}$ converges.

4 (15 points) Let $\{\tau_n\}$ be the sequence of triangular contours constructed in the proof of Theorem 3 of the video lecture 16, and $\forall n \in \mathbb{N}$, $w_n \in I(\tau_n)$. Then $\{w_n\}$ converges to a point $c \in \mathbb{C}$. Show that $\forall n \in \mathbb{N}$, $c \in \overline{I(\tau_0)}$.

5 (15 points) Let $\{w_n\}$ and $\{z_n\}$ be sequences in $\mathbb{C}$ such that $\forall n \in \mathbb{Z}^+$, $|w_n - z_n| < 1/n$ and that $\{z_n\}$ converges to a complex number z. Show that $\{w_n\}$ converges to z as well.

6 (10 points) Solve Exercise Problem 6.1 on page 117 of the textbook (Howie's Complex Analysis).

7 (10 points) Solve Exercise Problem 6.2 on page 117 of the textbook (Howie's Complex Analysis).

Instruction for submitting homework papers: Prepare a PDF of your homework paper and send it by email to Math 401's teaching assistant, Mr. Keremcan Doğan, before the deadline (Thursday April 09, 2020 at 13:00). His email address is kedogan@ku.edu.tr. You should also upload a copy of this PDF to Math 401's Blackboard page.