



Due Date: 26 October 2015, Monday  
Time: Class time  
Instructor: Ali Sinan Sertöz

NAME:.....  
STUDENT NO:.....

### Math 202 Complex Analysis – Homework 2

1	2	3	4	5	TOTAL
20	20	20	20	20	100

*Please do not write anything inside the above boxes!*

Check that there are **5** questions on your exam booklet. Write your name on top of every page. Show your work in reasonable detail. A correct answer without proper or too much reasoning may not get any credit. **Submit your solutions on this booklet only. Use extra pages if necessary.**

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### Rules for Homework and Take-Home Exams

- (1) You may discuss the problems only with your classmates or with me. In particular you may not ask your assigned questions or any related question to online forums.
- (2) You may use any written source be it printed or online. Google search is perfectly acceptable.
- (3) It is absolutely mandatory that you write your answers alone. Any similarity with your written words and any other solution or any other source that I happen to know is a direct violation of honesty.
- (4) You must obey the usual rules of attribution: all sources you use must be explicitly cited in such a manner that the source is easily retrieved with your citation. This includes any ideas you borrowed from your friends.
- (5) Even if you find a solution online, you must rewrite it in your own narration, fill in the blanks if any, making sure that you exhibit your total understanding of the ideas involved.

**Affidavit of compliance with the above rules:** I affirm that I have complied with the above rules in preparing this submitted work.

*Please sign here:*

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**Q-1** Prove or disprove Exercise 2.31 (8) on page 48: "Consider two antipodal points  $(x, y, u)$  and  $(-x, -y, -u)$  on the Riemann sphere. Show that their stereographic projections  $z$  and  $z'$  are related by  $zz' = -1$ ".

**Solution:**

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**Q-2)** Fix four distinct points  $z_1, z_2, z_3, z_4$  in  $\mathbb{C}$ . Let  $\lambda = (z_1, z_2, z_3, z_4)$  be their cross-ratio. Let  $S_4$  be the permutation group on  $\{1, 2, 3, 4\}$ , and define  $\lambda_\sigma = (z_{\sigma(1)}, z_{\sigma(2)}, z_{\sigma(3)}, z_{\sigma(4)})$  be the corresponding cross-ratio for  $\sigma \in S_4$ . Find all  $\lambda_\sigma$ .

**Solution:**

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**Q-3)** Find all zeros of  $\sin z$  and  $\cos z$  in the complex plane.

**Solution:**

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**Q-4)** For any  $z \neq 0$  in the complex plane, calculate  $(\exp \circ \log)(z)$  and  $(\log \circ \exp)(z)$ .

**Solution:**

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**Q-5)** Calculate all values of  $i^{i^i}$  and  $|i^{i^i}|$

**Solution:**