

SPRING 2018 – MAA 4402/5404 — COMPLEX VARIABLES — HOMEWORK 1

NAME: \_\_\_\_\_

ACKNOWLEDGEMENT OF OUTSIDE HELP: (List anyone that helped with this assignment. List in other books or websites you used. It is OK to get help from anyone in the class and from Dr.G. It is not ok to use someone else's work without proper citation.)

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INSTRUCTIONS:

- Due Friday, January 19, 2018 either at the beginning of class or by 4pm at LIT 408.
- Staple this cover-sheet (or reproduction) to your homework.
- Write in complete sentences.
- Solutions to be problems should be written in a proper and coherent manner. Explain your reasoning. All work should be handwritten and neat. Write in such a way that any student in the class can follow your work. Use examples from class and the textbook as models for your work.
- Show all necessary work.
- **Getting help:** You may use the textbook, class notes and get help from other class members as well as Dr.G. Help is basically restricted to discussion. Any other help such as other books, websites or people must be properly cited. Of course copying someone else's work is not permitted.

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TOTAL POSSIBLE: 10 pts

- (1) [3 pts] PROVE the following property of complex numbers from the definition of complex multiplication. Use either the definition given on p.1 of the ONLINE notes, or the definition given on p.2 of the textbook.

If  $z_1, z_2, z_3 \in \mathbb{C}$  then

$$z_1(z_2z_3) = (z_1z_2)z_3.$$

- (2) [2 pts] Let  $z \in \mathbb{C}$ . Prove each of the following.

(i)  $\operatorname{Re}(iz) = -\operatorname{Im}(z)$ . (ii) If  $\operatorname{Im}(z) > 0$  then  $\operatorname{Im}(1/z) < 0$ .

(3) [3 pts] Sketch the following sets of complex numbers.

(a)  $\{z : |z - 1 + i| > 1\}$

(b)  $\{z : |\bar{z} - 1 + i| < 1\}$

(c)  $\{z : \text{Arg}(z + i) = \frac{\pi}{4}\}$

(4) [2 pts] Show that

$$|\text{Re}(2 + 3(\bar{z})^2 + iz)| \leq 6, \quad \text{when } |z| \leq 1.$$