Math 431 Complex Analysis Spring 2020 HW 4

- (1) Chapter 4 Q 22
- (2) Chapter 5 Q 10, 12, 15, 16, 18
- (3) From now on we'll write fg for $f \circ g$.

For $a \in \mathbb{C}$ let h_a denote a half turn (180° rotation) about a. For any straight line l, let r_l denote reflection in l.

- (a) What is $r_l r_m$ if (i) l and m intersect; (ii) if l and m are parallel?
- (b) Show that $r_l r_m = r_m r_l$ if and only if l and m are orthogonal (i.e. they cross at right angles).
- (c) Show that $h_a r_l = r_l h_a$ if and only if a lies on l.
- (d) Show that $h_a h_b = h_c h_a$ if and only if a is the midpoint of bc.

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- (e) Show that $h_a r_l = r_l h_b$ if and only if l is the perpendicular bisector of ab.
- (f) Under what circumstances does $h_a h_b h_c h_d = 1$?
- (g) Under what circumstances does $r_l r_m = r_n r_l$?