

Due Date: Nov 22, 2018 (in class)

(1) Show that

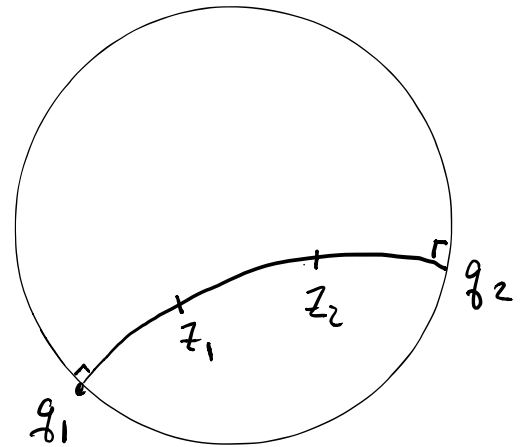
$$d(z_1, z_2) = \ln(z_1, z_2, q_2, q_1)$$

where q_1, q_2 are determined as

in the following figure, and

(z_1, z_2, q_2, q_1) is the

cross ratio.



(2) Let C be the circumference of a hyperbolic circle with hyperbolic radius R . Show that

$$C = 2\pi \sinh(R).$$

(3) Prove that any 2 horocycles are congruent.

(4) (a) Calculate $(1+i-j)(3k+2i)$

(b) Find the Cartesian form of $\frac{1}{1+i-j}$

(5) Show that for any quaternions q and r :

$$(a) (qr)^* = r^* q^*$$

$$(b) |qr| = |rq|$$

$$(c) \text{ If } q \neq 0, \text{ then } q^{-1} = \frac{q^*}{|q|^2}.$$

(6) Let q and r be two 3-dim'l vectors represented as pure quaternions. Show that

$$q \perp r \Leftrightarrow qr = -rq.$$

(End)