

Homework 2

Geometry, MTH 329 Spring 2026

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Due: Wednesday Feb 25th ^{1 2}

Reading

1. Sections 3.3, 4.1, 4.2
2. *Think Globally* by Steven Strogatz (<https://www.math.csi.cuny.edu/~abhijit/329/resources/article-Strogatz-ThinkGlobally.pdf>)
3. Pages 1 -8, Notes on Spherical Geometry: <https://www.math.csi.cuny.edu/~abhijit/329/resources/sg-notes.pdf>

Problems

1. Page 56, Section 3.3: 7, 9 (Hint: Use Theorem 3.5), 12, 13, 14.
2. Find the great circle containing the following pairs of points.
 - (a) $P = (0, 0, -1)$ and $Q = (0, 1, 0)$.
 - (b) $P = (1/2, -1/2, 1/\sqrt{2})$ and $Q = (2/3, 1/3, -2/3)$.
3. Are the points $P = (0, 0, -1)$, $Q = (0, 1, 0)$ and $R = (0, 0, 1)$ collinear ?
4. Find the spherical distance between the following pairs of points.
 - (a) $P = (0, 0, -1)$, $Q = (0, 1, 0)$.
 - (b) $P = (1/2, -1/2, 1/\sqrt{2})$, $Q = (2/3, 1/3, -2/3)$.
 - (c) $P = (0, 1/2, \sqrt{3}/2)$ and $-P = (0, -1/2, -\sqrt{3}/2)$.
5. Find angle between the following great circles:
 - (a) $L_{\vec{j}}$ and $L_{\vec{k}}$

¹Please upload pdf scan on Brightspace

²All section, chapter, page and example numbers refer to the book "Geometry: The Line and the circle" by Carroll and Rykken.

(b) $L_{\langle 1/3, 2/3, 2/3 \rangle}$ and $L_{\langle -3/5, 4/5, 0 \rangle}$

6. Find the area of the triangle with the following vertices:

(a) $P = (1, 0, 0)$, $Q = (0, -1, 0)$ and $R = (0, 0, -1)$.

(b) $P = (1/2, -1/2, 1/\sqrt{2})$, $Q = (2/3, 1/3, -2/3)$, and $R = (1, 0, 0)$.

7. Can we have a polyhedron consisting of 12 hexagonal faces and every vertex of degree 4?

Hand-in: Problems 3.3.9, 3.3.12, 2b, 4c, 5b, 6b.