



WEEK 5/6





CHAPTER TWO

- Lines and Planes in Space



OUTLINE

- Recap with Point of Intersection of Two Lines, Angle between Two Lines, Distance of a Point from a Line
- 3D Coordinate System
- The Straight Line in 3D Space
- The Plane



CLARIFICATION FROM SLIDES 35 AND 37 (WEEK 4)



POINT OF INTERSECTION OF TWO LINES



ANGLE BETWEEN TWO LINES



REMARK



EXAMPLE



DISTANCE OF A POINT FROM A LINE





EXAMPLE



3D COORDINATE SYSTEM



EXAMPLE



DISTANCE BETWEEN 2 POINTS IN 3D



THE STRAIGHT LINE IN 3D SPACE





THEOREM



EXAMPLE



COORDINATIZING 3-SPACE



EXAMPLE



VECTORS: INTRODUCTION 3D



QUICK REVIEW



EXAMPLE



DEFINITION



VECTOR EQUATION OF A LINE



PARAMETRIC EQUATIONS OF A LINE



SYMMETRIC EQUATION OF A LINE



EXAMPLE



EXAMPLE



BRING IT ALL TOGETHER



EXAMPLE



EXAMPLE



EXAMPLE



EXAMPLE



EQUATION OF A LINE PASSING THROUGH TWO GIVEN POINTS

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EXAMPLE



ANGLE BETWEEN TWO LINES



EXAMPLE



THE PLANE



PRELIMINARY CONCEPT



DEFINITION



PLANES IN TERMS OF VECTOR





EXAMPLE



THE PLANE WITH SYMMETRIC EQUATIONS







EXAMPLE



4 WAYS TO DETERMINE A PLANE



TWO POSTULATES CONCERNING LINES AND PLANES



THEOREMS

- A line and a point not on the line determine a plane
- Two intersecting lines determine a plane
- Two parallel lines determine a plane



PROOF



TWO POSTULATES CONCERNING LINES AND PLANES

- If a line intersects a plane and not containing it, then the intersection is exactly one point
- If two planes intersect, their intersection is exactly one line



PERPENDICULARITY OF A LINE AND A PLANE : A LINE PERPENDICULAR TO A PLANE



BASIC THEOREM OF A LINE PERPENDICULAR TO A PLANE



EXAMPLE



EXAMPLE



EXAMPLE



PARALLEL PLANES



THEOREM



PROPERTIES RELATING PARALLEL LINES AND PLANES



EXAMPLE



LINE IN PLANE- IMPLICIT EQUATIONS



LINE IN PLANE- PARAMETRIC EQUATIONS



EXAMPLE



COUNTING DEGREES OF FREEDOM



MEANING OF DEGREES OF FREEDOM



EXAMPLE



VECTOR EQUATIONS



PLANES IN SPACE



PLANE IN SPACE: ANGLES



DISTANCE TO LINES AND PLANES



IMPLICIT LINES



PUT IT ALL TOGETHER

- Intersecting a line and a plane
- Intersecting two planes
- The angle between two lines
- The angle between a line and a plane
- The angle between two planes
- The distance between a point and a line
- The distance between a point and a plane
- The distance between two non-intersecting lines



INTERSECTING A LINE AND A PLANE



INTERSECTING TWO PLANES



THE ANGLE BETWEEN TWO LINES



EXAMPLE



THE ANGLE BETWEEN A LINE AND A PLANE



EXAMPLE



THE ANGLE BETWEEN TWO PLANES



EXAMPLE



THE DISTANCE BETWEEN A POINT AND A LINE



THE DISTANCE BETWEEN A POINT AND A PLANE



THE DISTANCE BETWEEN TWO NON-INTERSECTING LINES





RECAP PLANES AND VECTORS





EXAMPLE



EXAMPLE



EXAMPLE



FYI

- <https://www.re-thinkingthefuture.com/rtf-fresh-perspectives/a1202-importance-of-geometry-in-architecture/>