Math 1800-B Handout 4: Review

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One of the fundamental topic in Multivariable Calculus is to learn how to find equations of straight lines and planes in three dimensions, using ideas from vectors (dot and cross product) and parametric curves. This handout lists an incomplete but fairly diverse type of problems that you should be able to solve using these ideas.

§1. Equation of Plane

You should know how to find equation of a plane from the following data.

1. Plane through a given point and perpendicular to a given vector.

2. Plane through a given point and parallel to a given plane.

3. Plane containing a given line and parallel to a given plane.

4. Plane passing through three given points.

5. Plane through a given point and containing a given straight line.

6. Plane through a given point and containing the line of intersection of two other given planes.

7. Plane through a given point and perpendicular to two other given planes.

8. Plane passing through two points and perpendicular to a given plane.

9. Plane containing the line of intersection of two other given planes and perpendicular to a given plane.

§2. Equation of Straight Line

You should know how to find equation of a straight line from the following data.

1. Line through two given points.

2. Line through one given point and in the direction of a given vector.

3. Line through one given point and parallel to a given straight line.

4. Line of intersection of two given planes.

5. Line through one given point and perpendicular to a given plane.

6. Line through a given point, that is perpendicular to a given straight line and intersects this second line.

7. Line through a given point, that is parallel to (i.e. lies in) a given plane and perpendicular to a given straight line.

§3. Applications

You should be able to use equation of line and planes to find

1. Distance from a point to a plane.

2. Distance from a point to a straight line.

3. (Optional) Distance between two straight lines.

4. Equation of tangent line to a given parametric curve.

5. Intersection point of a given parametric curve and a given surface.

6. The angle of intersection of two parametric curves.