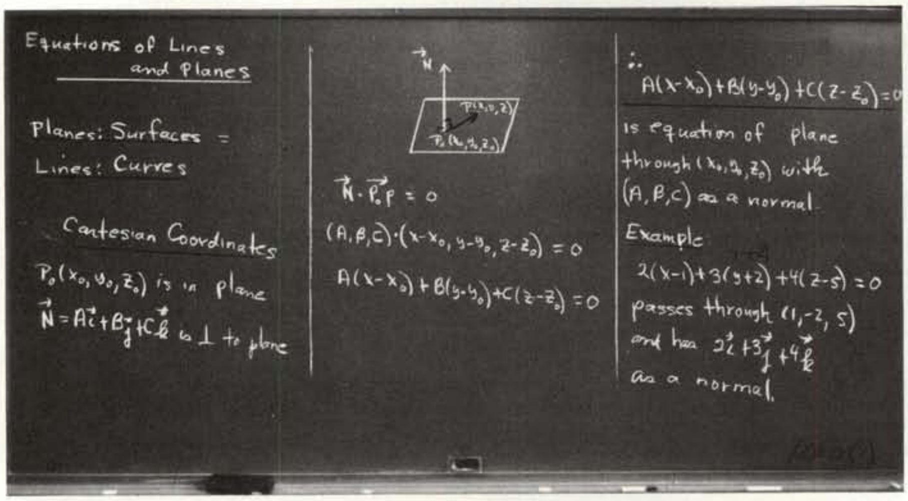
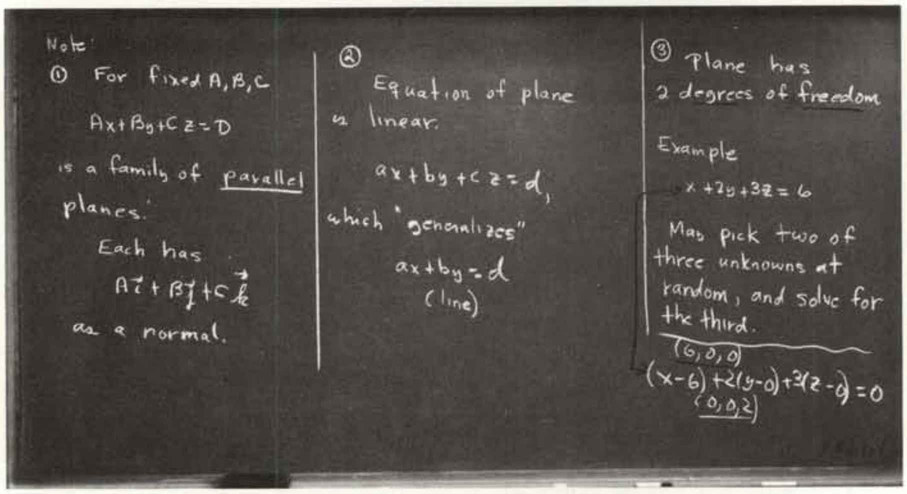
Unit 6: Equations of Lines and Planes

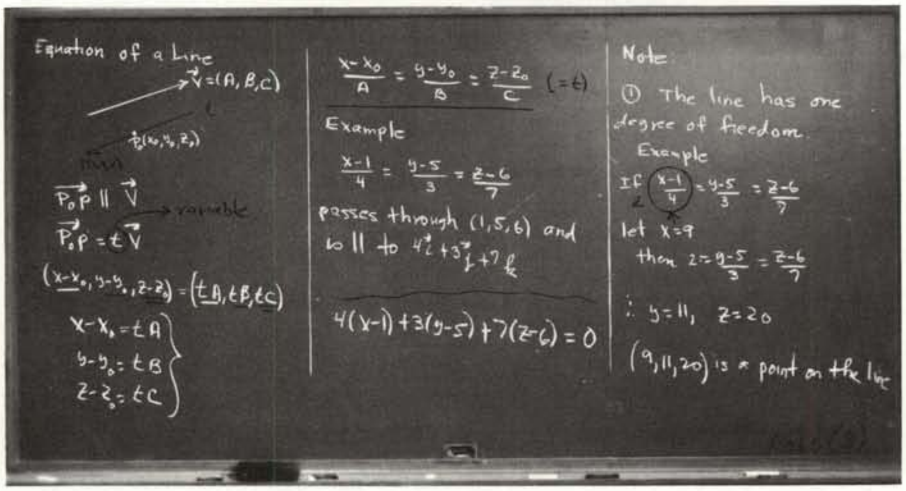
1. Lecture 1.060



a.

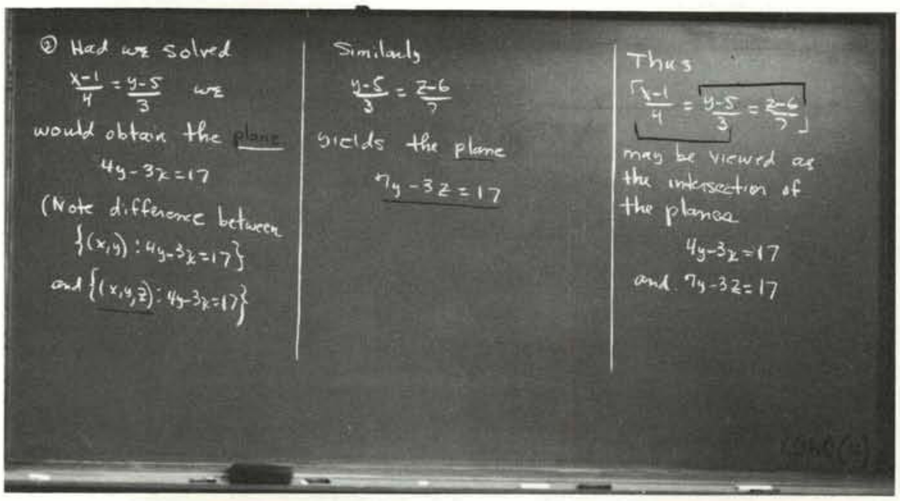


b.



c.

Lecture 1.060 continued



2. Read Thomas, section 12.8

3. Exercises:

1.6.1(L)

Find the equation of the plane determined by the points A(1,2,3), B(3,3,5), and C(4,8,1). (see Exercise 1.5.2)

1.6.2

Show that y = 2x is the equation of the plane which passes through (0,0,0) and has $2\vec{i} - \vec{j}$ as its normal.

1.6.3(L)

a. What is the equation of the line which is parallel to $3\vec{i} + 4\vec{j} + 2\vec{k}$ and passes through (-2,5,-1)?

b. At what point does this line intersect the xy-plane?

1.6.4

Find the directional cosines for the line

$$\frac{x-1}{6} = \frac{y+2}{3} = \frac{z-4}{2}.$$

1.6.5

At what point does the line which is parallel to $2\vec{i} + 3\vec{j} + 5\vec{k}$ and which passes through (-1,3,-2) intersect the plane given in Exercise 1.6.1?

1.6.6(L)

a. Find the distance from (7,8,9) to the plane 2x + 3y + 6z = 8.

b. At what point does the line through (7,8,9) perpendicular to the plane in a. intersect this plane?

c. Find the distance between the planes 2x + 3y + 6z = 22 and 2x + 3y + 6z = 8.

1.6.7

The points A(1,1,4) and B(3,4,5) are on the line L, while the points C(3,4,-1), D(4,6,2), and E(8,9,7) are in the plane M. At what point does the line L intersect the plane M?

1.6.8

a. Find the angle between the planes whose Cartesian equations are $3x + 2y + 6z = 8$ and $2x + 2y - z = 5$.

b. Find the Cartesian equation of the line which is the intersection of the two planes given in part a.

Quiz

1. By computing (-1)(1 - 1) in two different ways, use the rules and theorems of arithmetic to prove that (-1)(-1) = 1.

2. Find a unit vector which is normal to the curve $y = x^3 + x$ at the point (1,2).

3. Let A(1,3,5), B(3,4,7) and C(-1,0,-1) be points in space. Find a unit vector such that it originates at A; lies in the plane determined by A, B, and C; and bisects ∢BAC.

4. Let P denote the plane determined by the points A(1,2,3), B(3,3,5), and (4,4,9).

   (a) Determine the measure of ∢BAC.

   (b) Find the equation of the plane P.

   (c) What is the area of ΔABC?

   (d) At what point do the medians of ΔABC intersect?

   (e) What is the equation of the line which passes through C and is parallel to AB?

5. Find the distance of the point $P_o(2,3,4)$ from the plane whose Cartesian equation is $4x + 5y + 2z = 6$. Also determine the point at which the line through P_o, perpendicular to the plane $4x + 5y + 2z = 6$, intersects this plane.

Resource: Calculus Revisited: Multivariable Calculus
Prof. Herbert Gross