# Unit 8: Equations of Lines and Planes

## Chapter 1: Vector and Parametric Equations of a Line in R2

Study Tips: This chapter takes us back to the fundamentals of 2-Dimensional Equations (y = mx + b) and introduces a new concept: the vector equation of lines. While both cartesian equations and vector equations ultimately produce the same line on a graph, vector equations are represented as an addition between a point on the line and a direction vector (i.e. slope). Before going into this unit, make sure to know the difference between standard notation and y-intercept form, and how to find the slope of a line. On assessments, expect chapter 1 questions to be short-answer/multiple choice, and worth 1-2 points.

## Chapter 2: Cartesian Equation of a Line

Study Tips: Chapter 2 continues to build on the concept of incorporating vectors into an equation. Here, you are expected to be able to convert between cartesian equations, vector equations, and parametric equations. Once again, having a strong concept of slope will greatly benefit you in this chapter. Also, make sure to know how to separate an equation into its x and y components. Since you are expected to have a basic understanding of vector equations, expect to see slightly more difficult problems, such as finding the angle between two cartesian equations through the use of dot products. Remember to put arrows above your vectors.

## Chapter 3: Vector, Parametric, and Symmetric Equations of Lines in R3:

Studying Tips: Now that you are comfortable with working in two dimensions, chapter 3 takes those concepts to a whole new dimension. While this may seem daunting at first, the concepts are largely the same - all that is needed is to take the z-component into consideration. The only new concept introduced are symmetric equations, which are derived from parametric equations. Assessment questions will largely be the same as those found in chapter 2, such as asking whether a point lies on an equation or not.

## Chapter 4: Vector and Parametric Equations of a Plane

In this chapter, you will learn how to find the equations of a plane from directional vectors. This is where the unit begins to become more challenging. When solving the equation of a plane, remember:

* You must have two directional vectors or one point and a vector equation to begin with
* The two directional vectors cannot be parallel (collinear)
* The resulting equation takes in 2 parameters and therefore is 2-dimensional

Types of questions include determining whether a point lies on a plane and finding the vector and parametric equation of a plane containing a point and a line.

## Chapter 5: The Cartesian Equation of a Plane

In this chapter, you are expecting to determine the cartesian equation in or the normal vector- given three points, one vector and one point, or a vector form of a plane. Other things that you need to remember are that when two planes whose normals are

* the planes are parallel only if which .
* the planes are perpendicular only if

## Chapter 6: sketching planes in

To sketch a graph of a plane, consider the following cases as it relates to the cartesian equation in .

Case 1:

Planes whose cartesian equations have one variable and .

* If y and z variables are missing, the plane is parallel to the yz-plane.
* If x & y variables are missing, the plane is parallel to the xy-plane.

Planes whose cartesian equations have two variables and .

* Find the two intercepts, and draw a plane parallel to the missing variable axis.
* Ex: If the z variable is missing, the plane is parallel to the z-axis.
* The plane will not pass through the origin because

Planes whose cartesian equation have 2 variables and .

* Find a point with a missing variable set equal to 0. Join this point to (0,0,0), and draw a line plane containing the missing variable axis and this point.
* The plane contains the origin because

Planes whose cartesian equations have three variables and

* Find the three intercepts, and draw a plane that connects these points
* , thus, the plane does not pass through the origin

Planes whose cartesian equations have three variables and

* The plane pass through the origin
* Determine two points in addition to (0,0,0), and draw the plane through these points

Unit Studying Tips:

* Unit tests are usually out of 40-50 marks.
* Once you are good with the basics, focus on studying the R2 and R3 cartesian operations; these questions are the most frequently asked and worth the most number of marks.
* Create a list of questions that you are least comfortable with, and study them right before the test.
* Teachers likely will ask the same types of questions they teach you without making too many modifications - this unit is challenging in the sense that it's new for many students.
* Try our practice test without looking at the answers; if you can score 80% and above, you most likely will do well on your real test.

During the Test:

* If you don’t understand a question, draw it out. This whole unit is extremely visual, and drawing out the planes or equations might help you see the bigger picture.
* If you catch an error in the last minute of the class, don’t erase your entire solution; you always get part marks for those long answers.
* Check over your work as many times as possible - there is no rush to hand in your work early.