Today we discuss

1. the topics covered in MA 225 in general terms,
2. how this course will operate, and
3. some basic material regarding rectangular coordinates in three dimensions.

Rough Outline of MA 225

1. Geometry
   (a) straight and flat (vectors, lines, and planes)
   (b) curved things (curves and surfaces)
2. Partial Derivatives
   (a) tangent lines and planes
   (b) the gradient vector
   (c) optimization (max/min, constrainted max/min)
3. Multiple Integrals
   (a) double integrals (area and volume)
   (b) polar coordinates and double integrals
   (c) triple integrals (volume)
   (d) integrals in cylindrical and/or spherical coordinates
4. Vector Analysis
   (a) vector fields
   (b) line integrals
   (c) Greens Theorem
   (d) curl and flux
   (e) divergence, curl, flux integrals, and related theorems

Rectangular coordinates:

Every point in space can be described by a triple (x, y, z) of numbers after one designates a rectangular coordinate system.

One of the most important formulas involving rectangular coordinates is the distance formula: Given two points $P_1 = (x_1, y_1, z_1)$ and $P_2 = (x_2, y_2, z_2)$, the distance between them is given by

$$\text{dist}(P_1, P_2) = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}.$$

We can use the distance formula to find equations for various objects.

Example. Find the equation of a sphere of radius 2 centered at the point $(3, -1, 1)$.