Math 20550-02, Spring 2012

Review for Exam 1

Topics

- Coordinate systems
  - Rectangular coordinates
  - Cylindrical coordinates
  - Spherical coordinates
  - Distance formula
  - Equation of a sphere

- Determinants of order 2 and 3
  - Use in computing area of parallelogram
  - Use in computing volume of parallelepiped

- Vectors
  - Addition, multiplication by scalars
  - Magnitude (length), unit vector
  - Components
  - Standard basis
  - Dot product and cross product
    * Definitions
    * Formulas in terms of angle between vectors
  - Orthogonal
  - Projection of $\mathbf{b}$ on $\mathbf{a}$.

- Lines
  - Determined by a point and a direction vector
    * Parametric equations
  - Determined by 2 points
  - Determined as intersection of 2 planes

- Planes
  - Determined by a point and a normal vector
    * Equation $\mathbf{n} \cdot (\mathbf{r} - \mathbf{r}_0) = 0$ or $ax + by + cz + d = 0$
- Determined by 3 points
- Determined by two lines which are not parallel or skew

- Cylinders, quadric surfaces and their traces

- Vector functions, space curves and parametrized curves
  - Derivatives and integrals of vector functions
  - Length
  - Arc length function
  - Unit tangent, normal and binormal of a curve (Frenet frame)
    * Osculating plane
    * Normal plane
    * Curvature
      - Definition in terms of parametrization by arc length
      - Formulas actually used for computing it
    * Osculating circle
  - Velocity and acceleration

- Functions of several variables
  - Graphs
  - Level curves or contours—contour maps