

Part I: Geometry & Vectors (You are not responsible for pages marked with an x.)

1 Coordinate Systems

- a Rectangular Coordinates - 2D, 3D and nD 1 2 3x
- b Distance Formula - 2D, 3D and nD 1 2 3x
- c Polar Coordinates - 2D 1 2
- d Cylindrical and Spherical Coordinates - 3D and nD 1 2 3x

2 Functions of Several Variables (postpone until exam 2)

- a Formulas 1 2
- b Graphs 1 2
- c Level Sets and Contour Plots 1 2 3
- d Maxima, Minima, and Saddle Points 1 2 3

3 Vectors

- a Definition, Magnitude and Direction 1 2 3 4
- b Vector Addition 1 2 3x
- c Scalar Multiplication 1 2 3x
- d Linear Combinations and ijk Notation 1 2
- e Applications 1 2

4 Dot Product

- a Definition 1 2x 3
- b Angles 1
- c Projection 1 2
- d Application - Work 1

5 Cross Product

- a Determinants 1 2 3(no proofs)
- b Cross Product and Triple Product Definitions 1 2 3(only Thm 8) 4
- c Area 1
- d Volume 1 2x
- e Application - Balancing Torques 1x

6 Lines and Planes

- a Lines -- Parametric Equations 1 2x
- b Lines -- Non-Parametric Equations 1 2x 3x
- c Distance From a Point to a Line 1 2x
- d Parallel, Intersecting, and Skew Lines 1x 2
- e Planes -- Parametric Equations 1 2x
- f Planes -- Non-Parametric Equations 1 2 3
- g Distance From a Point to a Plane 1
- h Parallel and Intersecting Planes 1
- i Parallel and Intersecting Lines and Planes 1(only Example 1)
- j Review of Lines and Planes 1

7 Curves and Surfaces

- a Preview of Curves and Surfaces 1
- b Curves in  $R^2$  1 2(briefly) 3(briefly)
- c Curves in  $R^3$  1
- d Surfaces in  $R^3$  1 2(only summary) 3(only summary)

8 Properties of Curves

- a Vector Functions, Position, Velocity and Plots 1 2
- b Limits and Derivatives of Vector Functions 1(briefly) 2(briefly)
- c Velocity, Acceleration, and Jerk 1
- d Arc Length, Arc Length Parameter, and Speed 1 2(briefly) 3
- e Tangent, Normal, and Binormal Vectors 1
- f Curvature and Torsion 1 2
- g Tangential and Normal Acceleration 1
- h Summary: Circle, Helix, Twisted Cubic 1 2x 3x 4x 5x
- i Frenet Frames 1x
- Tutorial

9 Line Integrals

- a Arc Length 1
- b Line Integrals of Scalars 1
- c Applications: Mass, Center of Mass, Centroid, and Average Value 1 2
- d Line Integrals of Vectors 1
- e Applications: Work, Flow and Circulation 1 2