

Section 14.3 and 14.4 The Dot Product and the Cross Product

- Understand the definition of the dot product of two vectors and be able to compute the dot product of two vectors.
- Understand the basic properties of the dot product, including the connection between the dot product and the norm of a vector.
- Be able to compute the angle between a pair of vectors using the dot product. Also be able to detect when two vectors are perpendicular using the dot product.
- Be able to compute the component of a vector in the direction of another vector. Also be able to compute the work done by a constant force vector in moving an object along a position vector.
- Understand the definition of the cross product of two vectors and be able to compute the cross product of two vectors.
- Understand the basic properties of the cross product, including the fact that the cross product of two vectors is a vector perpendicular to both satisfying the right hand rule.
- Be able to compute the angle between a pair of vectors using the cross product. Also be able to detect when two vectors are parallel using the cross product.
- Be able to compute the areas of triangles and parallelograms and the volume of a parallelepiped using the cross product. Also be able to find the distance of a point from a line (but you do not need to memorize the formula for finding the distance from a point to a plane).

Section 14.5 Lines and Planes

- Understand the both parametric and symmetric equations for a line in 3D space and be able to find an equation for a line from a description of the line. Also be able to graph lines.
- Understand skew lines and be able to find the point of intersection of a pair of lines that do intersect.
- Understand what a normal vector to a plane is, and be able to find the equation of a plane when given either a normal vector and a point on the plane, or, given 3 points on the plane.
- Be able to determine whether or not a pair of planes are parallel. If not, be able to find an equation for the line of intersection of two planes.
- Be able to sketch the graph of a plane.

Section 14.6 Surfaces in 3-Space

- Understand how to sketch a 3D surface by looking at its traces.
- Understand what a “cylinder” is and be able to sketch the graph of cylinders in 3D space.
- Understand the graphs of all of the standard quadric surfaces and be able to identify and sketch the graph of a quadric surface when given its equation.

Section 15.1 and 15.2 Vector Valued Functions and Calculus on Vector Valued Functions

- Understand what a vector valued function is both in terms of the vectors it outputs and in terms of the Curve in space traced out by the vectors when they are thought of as position vectors.
- Be able to sketch both the vectors and curves associated with various vector valued functions.
- Be able to find the arc length of the curve determined by a vector valued function on a given interval.
- Understand how to find limits, determine continuity, compute derivatives, and definite integrals involving vector valued functions.
- Understand the meaning of the derivative of a vector valued function as the tangent vector to the associated curve.
- Be able to solve application problems involving vector valued functions.

Section 15.3 Vector Valued Functions and Motion

- Understand the basics of describing motion space using a vector valued function and its derivatives.
- Be able to compute velocity, acceleration, speed, and work in a given situation involving a vector valued function.
- Be able to sketch the graph of the curve associates with a vector valued function along with the tangent vector and acceleration vector to the curve at a given point.
- Be able to do projectile motion computations in both 2D and 3D.