Winter 2012 Math 224 Chapter 13

Section 13.1 Displacement Vectors

- Addition and subtraction of displacement vectors; scalar multiplication of displacement vectors.
- Resolving a vector into components; magnitude of a vector in components (unit vectors); addition and scalar multiplication in components.
- Components of a displacement vector $\overrightarrow{P_1P_2}$;

Section 13.1, Exercises and Problems: 1 - 6, 7 - 25 (odd), 26 - 31, 33 - 40, 42, 43

Section 13.2 Vectors in General

- Velocity versus Speed
- Vectors in n-dimensions

Section 13.2, Exercises and Problems: 7 - 11, 13, 15, 16, 18, 19, 21, 25, 26

Section 13.3 The Dot Product

- Two definitions give the same result: for any vectors

$$\vec{v} = v_1\,\vec{i} + v_2\,\vec{j} + v_3\,\vec{k} \quad \text{and} \quad \vec{w} = w_1\,\vec{i} + w_2\,\vec{j} + w_3\,\vec{k}$$

  with an angle θ between them

$$\vec{v} \cdot \vec{w} = \|\vec{v}\|\,\|\vec{w}\|\,\cos\theta = v_1w_1 + v_2w_2 + v_3w_3.$$

- $\vec{v}$ and $\vec{w}$ are perpendicular (orthogonal, normal) if and only if $\vec{v} \cdot \vec{w} = 0$.
- $\vec{v} \cdot \vec{v} = \|\vec{v}\|^2$.
- Orthogonal vectors and the equation of a plane
- Projections; Work.

Section 13.3, Exercises and Problems: 1 - 17, 18 - 27 (odd), 28, 30, 31, 33, 35, 38, 40, 43, 44, 48, 55, 61, 63

Section 13.4 The Cross Product

- For vectors $\vec{v} = v_1\,\vec{i} + v_2\,\vec{j} + v_3\,\vec{k}$ and $\vec{w} = w_1\,\vec{i} + w_2\,\vec{j} + w_3\,\vec{k}$

  $$\vec{v} \times \vec{w} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ v_1 & v_2 & v_3 \\ w_1 & w_2 & w_3 \end{vmatrix}$$ and $\|\vec{v} \times \vec{w}\|$ is the area of a parallelogram with edges $\vec{v}$ and $\vec{w}$.

- $\vec{a} \cdot \left(\vec{b} \times \vec{c}\right) = \begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}$ The absolute value of this determinant is the volume of the parallelepiped with edges $\vec{a} = a_1\,\vec{i} + a_2\,\vec{j} + a_3\,\vec{k}$, $\vec{b} = b_1\,\vec{i} + b_2\,\vec{j} + b_3\,\vec{k}$, $\vec{c} = c_1\,\vec{i} + c_2\,\vec{j} + c_3\,\vec{k}$.

Section 13.4, Exercises and Problems: 1 - 25, 29, 36, 41, 44, 45

Chapter 13, Review Exercises and Problems: 48, **49**, **50**, **51**, 52, 57.