

Practice Problem Set
CS335 Fall 2007

1. Given the following vectors:

$$\mathbf{a} = 3\mathbf{i} + 4\mathbf{j} + 2\mathbf{k}$$

$$\mathbf{b} = \mathbf{i} + \mathbf{j} + \mathbf{k}$$

$$\mathbf{c} = -2\mathbf{i} + 5\mathbf{j} + \mathbf{k}$$

Calculate each of the following:

a) $\mathbf{b} - \mathbf{a}$

b) $\mathbf{a} + \mathbf{c}$

c) $\mathbf{a} + \mathbf{b} + \mathbf{c}$

d) $2\mathbf{a} - 3\mathbf{b} + \frac{1}{2}\mathbf{c}$

e) $|\mathbf{b}|$

f) $|\mathbf{c}|$

1. Write the formula for calculating the angle between vectors.
2. Find the angles between the following pairs of vectors:

a) $\mathbf{p} = 3\mathbf{i} + 2\mathbf{j} - 6\mathbf{k}$ and $\mathbf{q} = 4\mathbf{i} - 3\mathbf{j} + \mathbf{k}$

b) $\mathbf{r} = (4, -2, 4)$ and $\mathbf{s} = (3, -6, -2)$

3. Four points are represented by the following coordinates: P(3, 1, 1), Q(4, 4, 2), A(1, 2, 1) and B(3, 8, 3). Calculate the vectors \mathbf{PQ} and \mathbf{AB} and show that they are parallel.
4. Calculate $\mathbf{a} \times \mathbf{b}$ and $|\mathbf{a} \times \mathbf{b}|$ where

a) $\mathbf{a} = \mathbf{i} + \mathbf{j} - \mathbf{k}$ and $\mathbf{b} = 2\mathbf{i} - \mathbf{j} + 3\mathbf{k}$

b) $\mathbf{a} = 3\mathbf{i} + 2\mathbf{j} + \mathbf{k}$ and $\mathbf{b} = -\mathbf{i} + 4\mathbf{k}$

5. Find two unit vectors perpendicular to both of

a) $3\mathbf{i} + 2\mathbf{j} + 5\mathbf{k}$ and $\mathbf{b} = 3\mathbf{j} - \mathbf{k}$

b) $\mathbf{i} + \mathbf{j} - \mathbf{k}$ and $\mathbf{j} + 2\mathbf{k}$

6. Consider a line passing through the point A(1, 1, 0) to B(5, 2, 0) and find its vector equation in terms of a parameter \mathbf{t} which takes values 0 at A and 1 at B. Determine the coordinates of the points P, Q, and R on this line, where \mathbf{t} takes values $\frac{1}{2}$, $1\frac{1}{2}$, and $-\frac{1}{2}$ respectively.
7. Repeat exercise 6 using the parameter \mathbf{v} , which takes values 1 at A and 0 at B.