Practice Problem Set  
CS335 Fall 2007

1. Given the following vectors:
   
   \[ a = 3i + 4j + 2k \]
   \[ b = i + j + k \]
   \[ c = -2i + 5j + k \]

   Calculate each of the following:
   
   a) \( b - a \)
   
   b) \( a + c \)
   
   c) \( a + b + c \)
   
   d) \( 2a - 3b + \frac{1}{2}c \)
   
   e) \( |b| \)
   
   f) \( |c| \)

1. Write the formula for calculating the angle between vectors.

2. Find the angles between the following pairs of vectors:
   
   a) \( p = 3i + 2j - 6k \) and \( q = 4i - 3j + k \)
   
   b) \( r = (4, -2, 4) \) and \( s = (3, -6, -2) \)

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 \( PQ \) and \( AB \) and show that they are parallel.

4. Calculate \( a \times b \) and \( |a \times b| \) where
   
   a) \( a = i + j - k \) and \( b = 2i - j + 3k \)
   
   b) \( a = 3i + 2j + k \) and \( b = -i + 4k \)

5. Find two unit vectors perpendicular to both of
   
   a) \( 3i + 2j + 5k \) and \( b = 3j - k \)
   
   b) \( i + j - k \) and \( j + 2k \)

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 \( t \) which takes values 0 at A and 1 at B. Determine the coordinates of the points P, Q, and R on this line, where \( t \) takes values \( \frac{1}{2} \), \( 1 \frac{1}{2} \), and \(-\frac{1}{2} \) respectively.

7. Repeat exercise 6 using the parameter \( v \), which takes values 1 at A and 0 at B.