HW. # 2

Homework problems are taken from textbook. The problems are color coded to indicate level of difficulty. The color green indicates an elementary problem, which you should be able to solve effortlessly. Yellow means that the problem is somewhat harder. Red indicates that the problem is hard. You should attempt the hard problems especially.

Find the angle between the following pairs of vectors.

1. **a** = **i** + 2**j** - **k**; **b** = 3**i** + 6**j** − 3**k**

2. **a** = 6**i** + 5**j** + 4**k**; **b** = **i** - **j** + **k**

3. **a** = 8**i** + 5**j** + **k**; **b** = -3**i** + 5**j** - **k**

Calculate the projection of **v** on **w**.

4. **v** = (4, 6, -5) and **w** = (-1, -2, -1)

5. **v** = 4**i** + 8**j** + 16**k** and **w** = 3**i** +9**j** +27**k**

6. What restrictions must be made on the scalar b so that the vector 2**i** + b**j** is orthogonal to
   a) −3**i** + 2**j** + **k**
   b) **k**

7. Find two nonparallel vectors both orthogonal to (1, 1, 1)

8. Find the line through (3, 1, -2) that intersects and is perpendicular to the line x = -1 +t, y = -2 +t, z = -1 +t

9. An airplane is located at position (3, 4, 5) at noon and traveling with velocity 400**i** +500**j** − **k** kilometers per hour. The pilot spots an airport at position (23, 29, 0)
   a) At what time will the plane pass directly over the airport? (Assume that the plane is flying over flat ground and that the vector **k** points straight up)
   b) How high above the airport will the plane be when it passes?