INSTRUCTIONS: Do your work on the ANSWER SHEETS which I am providing. You need not re-write the problem. Just do the work and box your answer. Circle any significant sub-results along the way. Do no more than two (2) problems per page. Label each problem. Draw a horizontal line between problems. Don’t crowd your work. Write on one side (the front side) only. Keep the top and left margins that I have drawn. (Do not write ANYTHING except the page number & total pages in the “circle” provided). When you are finished, put your pages in order with this test paper on top, come up to my desk and sign-out. I’ll do the stapling.

If you don’t get an acceptable answer but do show your work, I’ll give as much partial credit as I can, determined by your work. Full credit will be given only for an acceptable answer AND acceptable work. Extra Credit may be given.

Today you have 5 problems. Each problem counts 10 points. Today’s problems are taken from Sects 12.1-12.3. You will not get today’s problems back to “finish” on Friday.

#1. Find the coordinates of the center and the radius of the sphere whose equation is
\[ x^2 + y^2 + z^2 + 4x - 6y - 8z + 25 = 0 \]

#2. If \( \overrightarrow{AB} = -7\hat{i} + 3\hat{j} + 8\hat{k} \) and \( A \) is the point \((-2, -3, 6)\), find \( B \).

#3. Express this vector as a product of its length and direction. \( \vec{v} = \langle 9, -2, 6 \rangle \).

#4. Given \( \vec{u} = \langle 1, -1, 4 \rangle \) and \( \vec{v} = \langle 3, 0, -1 \rangle \), find (a) the cosine of the angle \( \theta \) between \( \vec{u} \) and \( \vec{v} \), and (b) the vector projection of \( \vec{v} \) onto \( \vec{u} \). Give an exact answer, not a decimal approximation.

#5. Find the direction cosines \( \cos \alpha, \cos \beta, \cos \gamma \) of the vector \( \vec{v} = \langle 2, -1, 5 \rangle \).

Give exact answers, not decimal approximations.