

Name: \_\_\_\_\_

1. Find the distance from  $(2, 4, -5)$  to each of the following:

(a) the  $yz$ -plane

5 pts

(b) the  $y$ -axis

5 pts

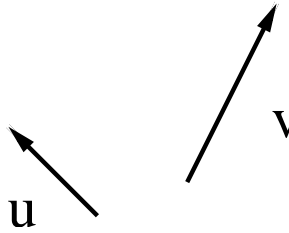
2. Write inequalities to describe the **SOLID** upper hemisphere of the sphere of radius 2 centered at the origin. Put a box around your answer.

5 pts

3. Show the equation  $4x^2 + 4y^2 + 4z^2 - 8x + 16y = 1$  represents a sphere, and find its center  $C$  and radius  $r$ , and put boxes around your answers.

5 pts

4. Copy the vectors in the figure, and use them do the following problems:



(a) Draw  $2\mathbf{u} + \mathbf{v}$ .

6 pts

(b) Draw  $\mathbf{u} - \mathbf{v}$ .

6 pts

(c) Determine whether  $\mathbf{u} \times \mathbf{v}$  is directed INTO the page or OUT OF the page.

Circle one:

**INTO**

**OUT OF**

6 pts

5. Find the exact angle that  $2\mathbf{i} + 3\mathbf{j} - 6\mathbf{k}$  makes with the  $x$ -axis.

8 pts

(OVER)

6. Consider  $\mathbf{b} = \langle -4, 1 \rangle$  and  $\mathbf{a} = \langle 1, 2 \rangle$ .

(a) Draw a sketch of  $\mathbf{b}$ ,  $\mathbf{a}$ , and  $\text{proj}_{\mathbf{a}}(\mathbf{b})$ , labeling each one and showing the scale on the axes.

12 pts

(b) Find the vector projection of  $\mathbf{b}$  onto  $\mathbf{a}$ . Put a box around your answer.

8 pts

7. A foot pushes a bicycle pedal with a 60-N force at an angle of  $80^\circ$  with the 18-cm long shaft of the pedal. Find the magnitude of the torque about the pedal. Put a box around your answer.

7 pts

8. Find a **UNIT** vector orthogonal to both  $\mathbf{j} + 2\mathbf{k}$  and  $\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$ . Put a box around your answer.

7 pts

9. Find symmetric equations for the line of intersection of the planes  $x - 2y + z = 1$  and  $2x + y + z = 1$ . Put a box around your answer.

10 pts

10. Find an equation for the plane that passes through the point  $(-2, 8, 10)$  and is perpendicular to the line  $x = 1 + t$ ,  $y = 2t$ ,  $z = 4 - 3t$ . Put a box around your answer.

10 pts