

1. If the sun's rays are parallel to the vector $\langle 2, 2, -1 \rangle$, determine the area of the shadow cast by the rectangle with coordinates $A(0, 0, 0)$, $B(2, 0, 0)$, $C(2, 0, 6)$, and $D(0, 0, 6)$ onto the xy -plane.

2a. Find the acute angle between the planes $2x + y - z = 10$ and $x - y + 3z = 0$.

b. Find the acute angle between the line $\mathbf{r} = \langle 1, 2, 3 \rangle + t \langle -1, 3, 4 \rangle$ and the plane $2x + y - z = 10$.

c. Find a parameterization of the line through the point $(1, 3, 5)$ and parallel to the line of intersection of the planes in part a).

3. Describe geometrically and algebraically the set of points equidistant from $(2, 1, -3)$ and $(4, -1, 1)$. Solve this problem two ways.

4. Describe geometrically and algebraically the locus of points 2 units from the plane $2x - y + 2z = 5$.

5. Show that the lines

$$\mathbf{r} = \langle 1, 5, -6 \rangle + t \langle 1, -1, 3 \rangle \text{ and}$$

$$\mathbf{r} = \langle 2, 4, 1 \rangle + s \langle 1, 2, 4 \rangle$$

are skew. Then find a direction perpendicular to both lines and use the appropriate projection to find the distance between these lines. What do we mean by the distance between two skew lines?

6. The northward facing roof of a building slopes upward at an angle of 30° . If the angle of elevation of the sun is 41° and its azimuth angle is 60° west of due south, does the sun shine through a skylight in the roof? If the area of the skylight is A , find the area of the floor (possibly zero) illuminated by the sun. The azimuth angle of the sun is the direction we face when we look at the sun.