

**Math 163****Lines**

1. A particle moves in space with a constant velocity. At time  $t = 0$  seconds it passes the point  $A(2, 0, -1)$  and at time  $t = 2$  seconds it passes the point  $B(6, -2, 5)$ . Find the position of the particle at time  $t$  seconds. When does the particle cross the  $yz$ -plane? Determine the angle at which the particle intersects this plane.
2. For this problem assume the suns rays are parallel to the vector  $\langle 2, 1, -1 \rangle$ .
  - a. Determine the shape and 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.
  - b. Find a parameterization of the shadow cast by the circle in the  $xz$ -plane with center  $(4, 0, 2)$  and radius 3 onto the  $xy$ -plane. Find the area enclosed by the shadow.
- 3a. Find the distance from the point  $P(3, 1, 0)$  to the line through the points  $A(-1, 0, 2)$  and  $B(1, 2, 1)$ .
- b. Find an equation of the right circular with radius 5 and axis of symmetry the line passing through the points  $A(-1, 0, 2)$  and  $B(1, 2, 1)$ .
- c. If the suns rays are parallel to the vector  $\langle 2, 2, -1 \rangle$ , find an equation (in rectangular coordinates) for the boundary of the shadow cast by the sphere with center  $(1, 3, 4)$  and radius 2 onto the  $xy$ -plane. Determine the area of the shadow.

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