1. What is ?
2. Find a vector orthogonal to both  and .
3. Find the area of the triangle with vertices , ,  using the cross product of vectors.
4. Determine whether the three points in problem 3 and the origin  are coplanar (lie in the same plane).
5. Find all unit vectors in the plane determined by vectors  and that are perpendicular to the vector 
6. Use the cross product to find the distance between point  and the line through points  and .
7. Determine whether the following pairs of planes are paralel, perpendicular or neither:
   1.  and 
   2.  and 
   3.  and 
8. Find the vector, point normal and general forms of the equations of the plane passing through point  and having  as a normal.
9. Find the parametric equation of the line passing through the points  and 
10. Find an equation of the plane that contains the point  and is paralel to the plane 
11. Find an equation for the plane that contains the line described by the equations and is perpendicular to the plane 
12. Find an equation for the plane that is perpendicular to the plane  and passes through the points  and .
13. Determine whether the line described by  and the plane  are perpendicular or paralel or neither.
14. Find the distance between the point  and the plane described by 
15. Find the distance between the planes described by  and 
16. Find parametric equations for the line of intersection of the planes  
17. Find the acute (<=90) angle between the line described by  and the plane .
18. Determine whether the lines  and  intersect in ? (Hint: can you solve for the parameters at the point of intersection? Is the linear system consistent?)
19. Find if  and 
20. Verify the Cauchy Scwartz inequality for the following vectors  and 
21. Find the Euclidean distance between points  and .
22. Can you find scalars  such that . If so, say what they are.
23. Find the domain, codomain, range ad the standard matrix for the linear transformation defined by the equations



(Hint: To determine the range apply row reduction on the linear system and read the constraint on in the row echelon form)

1. Use matrix multiplication to find
   1. The reflection of  about the x-axis
   2. The orthogonal projection of  onto the xz plane
   3. The orthogonal projection of  onto the x axis
   4. The rotation of around the x-axis by 
   5. The rotation of around the x-axis by  followed by dilation with factor 2, followed by reflection around  plane. What is the Standard matrix for the stated composition?
   6. The orthogonal projection of onto the x-axis followed by contraction with factor 2, followed by rotation around  axis by . What is the Standard matrix for the stated composition?
2. Let  be the orthogonal projection to the z axis,  be the rotation around the x-axis by . Is it true that ? Explain.
3. Let . Determine 
4. For each part below:Is the linear transformation given below one-to-one? What is the inverse transformation? Determine the range of the linear transformation.
5.  b) 
6. Let . Is the transformation linear? Explain.
7. Let a linear transformation  rotate a vector around the z-axis by  followed by an orthogonal projection onto the x-axis. Determine the standard matrix for this transformation from the images of the standard basis vectors.
8. Let  and  be two linear transformations, if one  is one-to-one and the is not, the compositions  be one-to-one? Explain.
9. Is the set of all pairs of real numbers of the form  a vector space if
   1. 
   2. 
   3. 
10. Is the set of all 2x2 matrices of the form  a vector space? Explain.
11. Is the set of all real numbers with the following definitions of addition and scalar multiplication a vector space. Explain why or why not.

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(Hint: Discuss the existence of a negative.)

1. Do the set of matrices with dimension nxn whose determinant is zero form a subspace of the set of matrices with dimension nxn? Do the set of matrices with dimension nxn whose determinant is not zero form a subspace of the set of matrices with dimension nxn.
2. Do the set of triangular matrices form a subspace? Do the set of real symmetic matrices form a subspace?
3. For each part below describe the solution space (subspace) of the homogeneous system



a)  b)  c) d) 

Specifically find equation(s) that describe the subspace

1. Do the vectors 
2. span 
3. span a subspace that includes
4. Are the vectors in prob. 37 linearly independent?