Math 201 Problem Set #1 on Chapter 12. C.S.Davis/M.K.Glasby

Name _____

Please show all the work that you would want me to consider in grading an hour quiz.

1. A taut wire is connected from a point A=(2,0,5) to a point B=(6,12,8).

   a. Give the vector **v** that runs along the wire from A to B.

   b. Find the length of the wire.

   c. Give the vector **w** from the origin to a point on the wire 2/5 of the way from A to B.

   d. Give a unit vector **u** along the wire.

   e. Write the vector **v** in terms of the standard basis vectors **i**, **j** and **k**.

   f. Suppose a constant force **F** =<1,2,3> is applied to drag a pulley along the full length of the wire. Find the work done.

2. Describe and/or sketch the region in R^3 determined by the inequality, $3 \leq x \leq 4$.

3. Describe and/or sketch the region in R^3 determined by the equation,
$x^2 + y^2 + z^2 - 2x + 12y - 8z = 11$.

4. Give inequalities that determine the upper solid hemispheroid obtained from a solid spheroid with center (2,1,-4) and radius 5.

5. For these vectors and scalars, $\mathbf{a}=\langle 1,3,5\rangle$ $\mathbf{b}=\langle 6,-1,2\rangle$ $\mathbf{c}=\langle 2,0,4\rangle$ $d=4$ $e=-2$, calculate all of the following.

   a. $\mathbf{a} + \mathbf{b}$

   b. $\mathbf{a} - \mathbf{b}$

   c. $d\,\mathbf{a}$

   d. $d\,\mathbf{a} + e\,\mathbf{b}$

   e. $\mathbf{a} \bullet \mathbf{b}$

   f. $\mathbf{a} \times \mathbf{b}$

   g. $|\mathbf{a} \times \mathbf{b}|$

   h. $\text{comp}_{\mathbf{a}}\,\mathbf{b}$

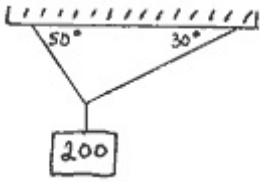
   i. $\text{proj}_{\mathbf{a}}\,\mathbf{b}$

   j. the area of the triangle determined by **a** and **b** in standard position.

   k. the volume of the parallelopiped determined by **a**, **b** and **c** in standard position.

   l. the direction cosines and direction angles of **a**.

6. Find the tension in the two wires holding the 200 pound weight below.



7. For the two vectors **a** and **b** in the diagram below, draw **a**+ **b**, **a** - **b** and 2**a**+3**b**.

8. For the vector **v** = <2,5,1> and the point P = (1,4,6),

   a. Give the three forms of the equation of the line parallel to **v** and passing through P.

   b. Give the equation of the plane perpendicular to **v** and passing through P.

   c. Tell the geometric relationship of the line and the plane above.

9. Given the parametric equations, x=1+2t, y=3+0t, z=5+6t, of a line L and the equation, 2x+3y - 2z =17 of a plane Q,

   a. Find the intersection point P of the line L with the plane Q.

   b. Find the vector **n** normal to the plane Q.

   c. Find the vector **v** parallel to the line L.

   d. Find the angle between **n** and **v**.

   e. Find the smallest angle between the line L and the plane Q.

9. f. Find the shortest distance from the point P=(2,5,10) to the plane Q.

10. Describe, sketch and name these plane and quadric surfaces in R^3.

    a. $x^2 + 4y^2 + z^2 = 16$

10. b. $x^2 + 4y^2 - z^2 = 16$

c. $x^2 - 4y^2 - z^2 = 16$

d. $x^2 + 4y^2 - z^2 = 0$

e. $x^2 + 4y^2 - z = 16$

f. $x^2 - 4y^2 - z = 16$

g. $x + 4y + z = 16$

h. $x^2 + 4y^2 = 16$

i. $4y^2 + z^2 = 16$

j. $x^2 - z^2 = 16$