MATH-5C TEST 1 (Chapter 12, 13.1, 13.2)
SAMPLE

100 points **NAME:**___________________________

Phones must be turned OFF and put away. No scratch paper. No graphing calculator. All of your solutions must be on this test paper. No credit will be given for solutions if work is not shown. I expect clear presentations with words of explanation.

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(1) Given the vectors $\mathbf{a} = -4\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$, $\mathbf{b} = 7\mathbf{i} - 2\mathbf{j} + \mathbf{k}$ and find the following: (4 points each)

a) $\mathbf{a} \times \mathbf{b}$ ___________________________

b) the angle between $\mathbf{a}$ and $\mathbf{b}$ _________________________

c) $\text{proj}_{\mathbf{a}}\mathbf{b}$ _________________

d) a vector of length 3 in the direction of $\mathbf{b}$ _____________

e) a value for k such that < k, 8,-6 > is orthogonal $\mathbf{b}$ ________________

f) If point P is (1,9,1) and point Q is (0, 10, 4) is $\overrightarrow{PQ}$ parallel to $\mathbf{a}$? ___________

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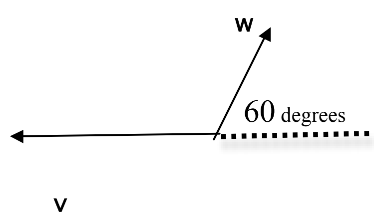
(2) Given the forces $\mathbf{v}$ and $\mathbf{w}$ as shown, where $\|\vec{v}\| = 40$ lbs and $\|w\| = 20$ lbs, find the resultant



(9 points each) (9 points
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(3) Find the intersection point of the following lines, if any, and find the equation of the plane containing them.

$$L_1 \begin{cases} x = 2t-1 \\ y = 1-t \\ z = 3t \end{cases} \qquad L_2 \begin{cases} x = 1+s \\ y = 2s \\ z = 3-2s \end{cases}$$

(7 points)

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(4) Prove: If $\mathbf{a}$ and $\mathbf{b}$ are vectors in R^3 and c is a real number then $(c\mathbf{a})\bullet\mathbf{b} = c(\mathbf{a}\bullet\mathbf{b})$..

(6 points)

(5) On separate axes, sketch a graph of the following surfaces. Name the surface and give pertinent information such as traces. (21 points)

(a) $9y^2 - 4z^2 = 36$

(b) $9x^2 + y^2 - z^2 = 9$

\ (c) $y = \sqrt{4x^2 + z^2}$

(6) Consider the following lines. Show whether they intersect, are parallel, or are skew. IF they intersect, find the point of intersection AND find the equation of the plane containing the lines. IF they are parallel or skew, find the distance between them.

(16 points)

$$L_1 \begin{cases} x = 2t + 1 \\ y = t \\ z = 4t + 1 \end{cases} \qquad L_2 \begin{cases} x = s \\ y = 2s - 2 \\ z = 3s - 2 \end{cases}$$

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(7) Find an equation of the plane that contains the line of intersection of the planes x-z=1 and y+2z=3 and is perpendicular to the plane x+y-2z = 1 (5 points)

(8) Find the point of intersection, if any, of the helix $\mathbf{r}_1(t) = \langle \cos t, \sin t, t \rangle$ and the curve $\mathbf{r}_2(t) = \langle 1+t, t^2, t^3 \rangle$. Find the equations of the tangent lines to each of the curves at this point.

(9) Sketch the graph of $\vec{r}(t) = \langle \cos t, 3\sin t, -t \rangle$, and show direction of increasing t. Give the equation of a surface on which this curve lies and show this surface on your sketch.

(12 points)