Name _____

Math 2673 9/15/2006 Sample Test 1

1. Let $b =< 1, 1, 1 >$ and $a =< 1, 0, 1 >$.
   i. Express b as $b = b1 + b2$ where **b1** is parallel to **a** and b2 is orthogonal to **a**
   ii. Sketch the appropriate triangle labeling all the vectors mentioned above.
   iii. Find the angle between b and a
2. Find the equation of a plane that contains the point $(1, 0, -1)$ and is parallel to the plane $x + y + z = 14$.
3. Find the equation of a line that passes through the points $(-1, -2, 4)$and $(4, 2, 1)$.
4.
   i. Find the equation of a plane through the points $(0, 0, 0), (1, 1, 1), (1, 2, 3)$.
   ii. Sketch the plane in the first octant.

4a.) do an arclength problem

5. For $r(t) = (2\cos(t), 2\sin(t), t)$.
   a. Sketch the curve in $R^3$and plot the points $t = 0, \pi/2, \pi, 2\pi$ and find and plot the tangent line at $t = \pi/4$
   b. Find $r'(t), r''(t), T, N, B$
   c. Write $r"(t)$ in terms of T, N
6. redo example 1 p 946

1. Express $b =< 2, 3, -1 >$ as $b = b1 + b2$ where **b1** is parallel to **a** and b2 is orthogonal to **a** and $a =< 0, 4, 2 >$.
2. Find the equation of a plane that contains the points $(2, 0, 1), (0, 6, -2)$ *and* $(-2, 3, 0)$
3. Find the equation of a plane that contains the point $(1, 0, -1)$ and is parallel to the plane $3x + 6y + 2z = 6$.
4. Find the parametric equations of a line that satisfies the condition that it passes through the point $(1, 0, 2)$ and is parallel to the line whose parametric equations $x = t + 1, y = 3t, z = 4t + 1$.
5. Find the parametric equations of a line that passes through the points $(1, 2, 3)$ and $(0, 1, 3)$.

6. Find the equation of a line that passes through the point $(1, 7, 0)$ and is parallel to the y-axis.

V. Sketch the following:

1. The surface $x^2 + y^2 + z^2 - 4x - 4y = 0$ (hint: complete the square). Partial credit will be given for the sketch in each of the planes.

2. For $r(t) = (t, \sqrt{2}\cos(t), \sqrt{2}\sin(t))$.
   a. Sketch the curve.
3. Sketch the surface $x^2 + y^2 - 9 = 0$

IV. Find the equation of the Plane which satisfy the following:

1. A plane through the points $(0, 0, 0), (1, 1, 1), (1, 2, 3)$.

2. A plane through the point $(0, 1, 2)$ and containing the line $x = t, 2y = t, 3z = t$.

3. Find the point where the line $x = t + 1, y = 2t, z = 3t$ and the plane $x + y + z = 1$ intersect.

I. Answer the following:

1.) Let L be the line in R^3 that passes through the points $P = (-1, -2, 4)$ and $Q = (4, 2, 1)$. At what point (if any) does L intersect the plane $x + y + 2z = 11$?

2.) If L is the line through $A = (3, 2, 1)$ and parallel to the vector $v =< -2, 1, 3 >$, what's the equation of the plane that contains L and the point $B = (-2, 3, 1)$.

3.) Find the distance from the origin to the plane $x + 2y + 2z = 6$.

4.) Graph the solid in the first octant bounded by the plane $x+2y+z = 4$.