Test Total

Name _____

Test 1 Honors Calculus III 3450:223–005 Dr. Norfolk September 26, 2008
Show all of your work and explain your reasoning.

1. Consider the triangle with vertices A(2,0,-5), B(4,4,-11) and C(6,1,-6).

   (a) Use Pythagoras' Theorem to show that it is a right triangle.

5 points

   (b) Find the angle at vertex A, to the closest degree.

5 points

   (c) Find the equation of the plane that contains the triangle.

5 points

2. Find the value of c so that the lines $L_1 : x = 2 - t,\ y = 1 + 2t,\ z = c + 4t$ and $L_2 : \dfrac{x-1}{1} = \dfrac{y+2}{-1} = \dfrac{z}{2}$ are *not skew*.

10 points

Page 1 Total (25)

3. Consider the line which is orthogonal to the plane $x - 2y + z = 4$, and passes through the point (0,1,3).

   (a) Find an equation for this line.

5 points

   (b) Find the point where the line intersects the plane.

5 points

4. The space curve $\mathbf{r} =< 2\cos(t), 3\sin(t), 3 - 2\cos(t) - 6\sin(t) >$ defines the intersection of an *elliptical cylinder* and a *plane*.

   Find equations for these two surfaces.

10 points

5. For $-4 < t < 4$, a particle has *velocity* $\mathbf{v} = 2t\mathbf{i} + \dfrac{8/\pi}{4+t^2}\mathbf{j} + \dfrac{6/\pi}{\sqrt{16-t^2}}\mathbf{k}$, and the *position vector* satisfies $\mathbf{r}(0) = \mathbf{i} + \mathbf{j}$.

   (a) Find the position function $\mathbf{r}$.

10 points

   (b) Determine if the particle passes through the point $5\mathbf{i} + \dfrac{1}{2}\mathbf{j} + \mathbf{k}$.

5 points

Page 2 Total (35)

6. The position of a particle for time $t \geq 0$ is given by $\mathbf{r} = 3t\mathbf{i} + (t-1)^2\mathbf{j} + te^{1-t}\mathbf{k}$ (distances in metres).

Find and simplify the following :

(a) The velocity function, $\mathbf{v}$

5 points

(b) The acceleration function, $\mathbf{a}$

5 points

(c) At time $t = 1$ second, find:

i. The *speed*, v

5 points

ii. The *unit tangent vector*, $\mathbf{T}$

5 points

iii. The *tangential component of acceleration*, a_T

5 points

iv. The *normal component of acceleration*, a_N

5 points

v. The *curvature*, κ

5 points

vi. The *unit normal vector*, $\mathbf{N}$

5 points

Page 3 Total (40)