Math 2210 - Quiz 1

University of Utah

Summer 2007

Name: _____

1. (10 points) For the vectors $\mathbf{a} = (3, 4, 7)$ and $\mathbf{b} = (2, 1, 3)$ calculate

   (a) (1 point)

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

   (b) (1 point)

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

   (c) (2 points)

     $\mathbf{a} \cdot \mathbf{b}$

(d) (2 points)

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

(e) (1 point)

Explain why $(\mathbf{a} \cdot \mathbf{b}) \times \mathbf{b}$ doesn't make sense.

(f) (3 points)

The equation for the plane that contains vectors $\mathbf{a}$ and $\mathbf{b}$ that passes through the point $(1, 4, 2)$.

Note - Equation should be in the form $Ax + By + Cz = D$.

2. (10 points)

For the vector valued function $\mathbf{r}(t) = (t^2, \frac{4\sqrt{3}}{3}t^{\frac{3}{2}}, 3t)$ calculate:

(a) (3 points)

The derivative $\mathbf{r}'(t)$

(b) (3 points)

The second derivative $\mathbf{r}''(t)$

(c) (4 points)

The arc length of the curve $\mathbf{r}(t)$ from $t = 1$ to $t = 4$.

3. (10 points)

    (a) (6 points)

        Find the symmetric equations of the tangent line to the curve
$\mathbf{r}(t) = (2t^2, 4t, t^3)$ at $t = 1$.

    (b) (4 points)

        Calculate the distance between the above tangent line and the
point $(4, 3, 1)$.

4. (10 points)

Convert the following points from Cartesian to cylindrical coordinates:

(a) (1 point)
$(5, 2, 7)$

(b) (1 point)
$(2, 4, 9)$

Convert the following points from Cartesian to spherical coordinates:

(a) (1 point)
$(5, 2, 7)$

(b) (1 point)
$(4, 11, 3)$

Convert the following from spherical to cylindrical coordinates:

(a) (1 point)
$\left(5, \frac{\pi}{3}, \frac{\pi}{6}\right)$

(b) (1 point)

$(2, 0, \pi)$

Convert the following from cylindrical to Cartesian coordinates:

(a) (1 point)

$(5, \frac{\pi}{6}, -2)$

(b) (1 point)

$(3, \frac{4\pi}{3}, -7)$

(2 points)

Convert the equation $x^2 + y^2 = 9$ to spherical coordinates.

5. (10 points)

For each equation below match it up with its corresponding surface and give the name of the surface. (So, where it asks for surface, give the letter of the surface corresponding to the equation.)

(a) (2 points)
$$4x^2 + 16y^2 - 32z = 0$$

Surface:

Surface Description:

(b) (2 points)
$$x^2 - y^2 + z = 0$$

Surface:

Surface Description:

(c) (2 points)
$$9x^2 + 25y^2 + 9z^2 = 225$$

Surface:

Surface Description:

(d) (2 points)

$$9x^2 - z^2 + 9y^2 - 9 = 0$$

Surface:

Surface Description:

(e) (2 points)

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

Surface:

Surface Description:

The possible surface descriptions are: ellipsoid, hyperboloid of one sheet, hyperboloid of two sheets, elliptic paraboloid, hyperbolic paraboloid, and elliptic cone.

The surface drawings are on the next page.