NAME: (print!) ____

Section: ____ **E-Mail address:** ____________________

MATH 251 (1-6,10-11), Dr. Z. , Second Practice for Exam 1 (Version of 6:36pm, Oct. 6, 2009, thanks to Marty L.)

FRAME YOUR FINAL ANSWER(S) TO EACH PROBLEM

Do not write below this line

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1. (out of 10)

2. (out of 10)

3. (out of 10)

4. (out of 10)

5. (out of 10)

6. (out of 10)

7. (out of 10)

8. (out of 10)

9. (out of 10)

10. (out of 10)

Types: Number, Function of *variable*(s), 2D vector of numbers, 3D vector of numbers, 2D vector of functions, 3D vector of functions, equation of a plane, parametric equation of a line, equation of a line, equation of a surface, equation of a line, DNE (does not exist).

1. (10 pts.) Find, as a function of t, the curvature of the curve

$$\mathbf{r}(t) = \langle e^t, t, e^{2t} \rangle$$

The **type** of the answer is:

2. (10 points) Find $\frac{\partial h}{\partial r}$ at $(q, r) = (3, 2)$ where $h(u, v) = ve^u$, $u = q^2$, $v = q^2 r$

The **type** of the answer is:

3. (10 points) Find $a_{\mathbf{T}}$ and $a_{\mathbf{N}}$ as a function of t if $\mathbf{r}(t) = \langle t, \cos t, \sin t \rangle$.

The **type** of the answer is:

4. (10 points) Find an equation of the tangent plane at the given point

$$z = xy\ln(x+y) \quad ,(1,1) \quad .$$

The **type** of the answer is:

5. (10 points) Find $\frac{\partial f}{\partial s}$ at $(r, s) = (1, 0)$, where $f(x, y) = \ln(xy)$, $x = 3r + 2s$, and $y = 5r + 3s$.

The **type** of the answer is:

6. (10 points) Find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ if

$$x^3 + y^3 + z^3 = 2xyz + 1 \quad .$$

The **type** of the answer is:

7. (10 points) Describe the vertical and horizontal traces of $f(x, y) = 9 - x^2 - y^2$. Sketch a few of them.
type of answers: Families of curves in xy-plane, xz-plane, and yz-plane. Diagrams.

8. (10 points) Find the length of the curve

$$\mathbf{r}(t) = \langle\, 1 \,,\, 3e^t \,,\, 4e^t \,\rangle \quad 0 \le t \le \ln 3 \quad .$$

The **type** of the answer is:

9. (10 points) Which of the following is the arc length parametrization of a circle of radius 10 centered at $(1,2)$. Explain!

(a) $\mathbf{r_1}(t) = \langle 1 + 10\cos t\,,\ 2 + 10\sin t\,\rangle$

(b) $\mathbf{r_2}(t) = \langle 1 + 10\cos 10t\,,\ 2 + 10\sin 10t\,\rangle$

(c) $\mathbf{r_3}(t) = \langle 1 + 10\cos \frac{t}{10}\,,\ 2 + 10\sin \frac{t}{10}\,\rangle$

(d) $\mathbf{r_4}(t) = \langle 1 + 10\cos 5t\,,\ 2 + 10\sin 5t\,\rangle$

(e) $\mathbf{r_5}(t) = \langle 10\cos t\,,\ 10\sin t\,\rangle$

10. (10 points) Find an equation to the plane that passes through the points $(1, 2, 3)$, $(2, 1, 3)$, $(3, 2, 1)$.

The **type** of the answer is:

Answers

1. $\frac{e^t\sqrt{1+16e^{2t}+4e^{4t}}}{(\sqrt{1+e^{2t}+4e^{4t}})^3}$ (type: Function of t).

2. $9e^9$ (type: Number). [Thanks to Sammy G. for the correction!]

3. 0 and 1 (types: functions of t that happen to be constant functions (by accident)).

4. $z = (\ln 2 + \frac{1}{2})x + (\ln 2 + \frac{1}{2})y - (\ln 2 + 1)$ (type: Equation of Plane).

5. $\frac{19}{15}$ (type: Number).

6. $-\frac{3x^2-2yz}{3z^2-2xy}, -\frac{3y^2-2xz}{3z^2-2xy}$ (type: functions).

7. $x^2 + y^2 = 9 - c$ (type: family of circles in xy-plane); $z = 9 - c^2 - y^2$ (type: family of parabolas in yz-plane); $z = 9 - c^2 - x^2$ (type: family of parabolas in xz-plane);

8. 10 (type: Number).

9. (c) (because the magnitute of $\mathbf{r_3}'(t)$ is always 1.

10. $x + y + z = 6$ (type: Equation of plane).