NAME: (print!) _____

Section: ___ **E-Mail address:** _____

MATH 251 (1-6,10-11), Dr. Z. , Fourth Practice for Exam 1 (version of 6:44am, Oct. 8, 2009, thanks to Victoria Gagliardi)
(Previous Version of 9:08am, Oct. 7, 2009, thanks to Victoria Gagliardi)

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 points) Find an equation of the tangent plane to the given surface at the specified point.

$$z = \ln(x^2 + y^2) \quad , \quad (1, 1, \ln 2) \quad .$$

The **types** of the answer are:

2. (10 points) Find an equation of the tangent plane to the surface

$$e^{x+y+z} = e^3 + xyz - 1$$

at the point $(1, 1, 1)$.

The **type** of the answer is:

3. (10 points) Find the curvature for

$$\mathbf{r}(t) = \sin 2t\,\mathbf{i} + \cos t\mathbf{j} + t\,\mathbf{k} \quad .$$

The **types** of the answers are:

4. (10 points) Compute f_{xx}, f_{xy}, and f_{yy} if

$$f(x, y) = \sin(x^3 + xy + y^3) \quad .$$

The **types** of the answers are:

5. (10 points) Find the velocity, acceleration, and speed of a particle with the given position function.

$$\mathbf{r}(t) = e^{t^2}\,\mathbf{i} + \sin t\,\mathbf{j} + \cos 3t\,\mathbf{k} \quad .$$

The **types** of the answer are:

6. (10 points) Find a parametric equation of the line of intersection of the planes $4x+y+z = 6$ and $x + 2y + 4z = 7$.

The **type** of the answer is:

7. (10 points) Find a parametric equation for the tangent line to the curve with the given parametric equation at the specified point

$$x = \cos 3t \quad , \quad y = \sin 2t \quad , \quad z = t^3 + 1 \quad ; \quad (1, 0, 1)$$

The **types** of the answers are:

8. (10 points) Write a definite integral that describes the length of the curve

$$\mathbf{r}(t) = \langle\, e^t\,,\, e^{2t}\,,\, e^t \sin 2t \,\rangle \quad , \quad 0 \le t \le 4\pi \quad .$$

Do not try to evaluate the integral!

The **type** of the answer is:

9. (10 points) Find $\mathbf{r}(t)$ if

$$\mathbf{r}'(t) = 3t^2\,\mathbf{i} + 2t\,\mathbf{j} + \cos t\,\mathbf{k}$$

and

$$\mathbf{r}(0) = \mathbf{i} + \mathbf{j} + \mathbf{k} \quad .$$

10. (10 pts.) A force with magnitude $100N$ is moving a body of mass $10kg$ in the direction $\langle -1, -2, -3 \rangle$. If at $t = 0$ the body is at location $(2, 0, 1)$ and it is moving with velocity $\langle 1, 1, 1 \rangle$,
(i)find its position vector $\mathbf{r}(t)$ at time t ;
(ii) find its speed at time t.

The **types** of the answers are:

Answers:
1. $z = x + y + \ln 2 - 2$ (Type: equation of a plane).
2. $x + y + z = 3$ (Type: equation of a plane).
3.

$$\frac{\sqrt{\cos^2 t + 16\sin^2 2t + 4(\cos 2t \cos t + 2\sin 2t \sin t)^2}}{\sqrt{4\cos^2 2t + \sin^2 t + 1}^3}$$

(Type: function of t).
4.

$$f_{xx} = -(3x^2 + y)^2 \sin(x^3 + xy + y^3) + 6x\cos(x^3 + xy + y^3) \quad ,$$

$$f_{xy} = -(3x^2 + y)(x + 3y^2)\sin(x^3 + xy + y^3) + \cos(x^3 + xy + y^3) \quad ,$$

$$f_{yy} = -(x + 3y^2)^2 \sin(x^3 + xy + y^3) + 6y\cos(x^3 + xy + y^3) \quad .$$

(f_{yy} corrected Oct. 7, thanks to Victoria Gagliardi)
(Type: functions of x, y).
5.

$$\mathbf{v}(t) = 2te^{t^2}\mathbf{i} + \cos t\mathbf{j} - 3\sin 3t\mathbf{k}$$

$$\mathbf{a}(t) = (4t^2 + 2)e^{t^2}\mathbf{i} - \sin t\mathbf{j} - 9\cos 3t\mathbf{k}$$

speed= $\sqrt{4t^2e^{2t^2} + \cos^2 t + 9\sin^2 3t}$.
(Type: vectorsof functions of t, function of t).
6. $x = \frac{5}{7} + 2t, y = \frac{22}{7} - 15t, z = 7t$, ($-\infty < t < \infty$). (Type: parametric eq. of a line).
7. $x = 1, y = 2t, z = 1$, ($-\infty < t < \infty$). (Type: parametric eq. of a line).
8.

$$\int_0^{4\pi} \sqrt{e^{2t} + 4e^{4t} + e^{2t}(\sin 2t + 2\cos 2t)^2}\, dt \quad .$$

(Type: Number defined in terms of a certian definite integral).
9. $(t^3 + 1)\mathbf{i} + (t^2 + 1)\mathbf{j} + (\sin t + 1)\mathbf{k}$
10. (i) $\langle\, 2 + t - \frac{5}{\sqrt{14}}t^2\,,\, t - \frac{10}{\sqrt{14}}t^2\,,\, 1 + t - \frac{15}{\sqrt{14}}t^2\,\rangle$. (Type: vector of functions of t)
(corrected Oct. 8, 2009, 6:43pm, thanks to Victoria G.) (ii)

$$\sqrt{(1 - \frac{10}{\sqrt{14}t})^2 + (1 - \frac{20}{\sqrt{14}t})^2 + (1 - \frac{30}{\sqrt{14}t})^2}$$

(Type: function of t).