NAME: (print!) _____

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

MATH 251 (1-6,10-11), Dr. Z. , Second Practice for Exam 2

Do not write below this line (office use only)

---

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)

---

total (out of 100)

---

1. (10 pts.) Show that the line integral

$$F(x, y, z) = (e^x + yz)\,\mathbf{i} + (e^y + xz)\,\mathbf{j} + (e^z + xy)\,\mathbf{k}$$

is conservative. If it is conservative, find a function f such that $\mathbf{F} = \nabla f$.

Ans. :

---

2. (10 points) Evaluate the line integral

$$\int_C \mathbf{F} \cdot d\mathbf{r} \quad ,$$

where C is given by the vector function $\mathbf{r}(t)$.

$$\mathbf{F}(x, y, z) = \sin(x + 2y + 3z)\,\mathbf{i} + 2\sin(x + 2y + 3z)\,\mathbf{j} + 3\sin(x + 2y + 3z)\,\mathbf{k} \quad ,$$

$$\mathbf{r}(t) = 3t\,\mathbf{i} + t\,\mathbf{j} + 2t\,\mathbf{k} \quad , \quad 0 \leq t \leq \pi/26 \quad .$$

Ans.:

---

3. (10 points) Find the Jacobian of the transformation

$$x = u + v + w \quad , \quad y = u^2 + v^2 + w^2 \quad , \quad z = u^3 + v^3 + w^3 \quad .$$

Simplify as much as you can!

Ans.:

---

4. (10 points) Evaluate the iterated integral

$$\int_0^2 \int_{2x}^{3x} \int_0^{x+y} z^2 \, dz \, dy \, dx \quad .$$

Ans.:

---

5. (10 points) Use polar coordinates to compute the double integral

$$\int\int_D (x + 2y)\, dA \quad ,$$

where

$$D = \{(x, y) \,|\, x^2 + y^2 \leq 1\,,\; x \geq 0\,,\; y \leq 0\,\} \quad .$$

Ans.:

---

6. (10 points) Evaluate the iterated integral by converting to polar coordinates.

$$\int_{-3}^{0} \int_{-\sqrt{9-x^2}}^{0} 3(x^2+y^2)^5 \, dy \, dx$$

Ans.:

---

7. (10 points) Find the volume of the solid bounded by the cylinder $y = x^2$ and the planes $z = 0$ and $y + z = 1$. Simplify as much as you can.

Ans.:

---

8. (10 points) Calculate the double integral

$$\int\int_R \frac{(3x^2+2)y^2}{x^3+2x+1}\,dA \quad ,$$

$$R = \{(x,y)\,|\,0 \le x \le 1\,,\ -2 \le y \le 0\,\} \quad .$$

Ans.:

---

9. (10 points) Change the order of integration in

$$\int_e^{e^3} \int_0^{\ln x} f(x,y)\, dy\, dx \quad .$$

Ans.:

---

10. (10 points) Find the local maximum and minimum **values**, the local maximum and minimum **points** (i.e. locations), and saddle point(s) of the function $f(x, y) = x^4 + y^4 - xy - 2$.

Local maximum value(s): **at**

Local minimum value(s): **at**

saddle point(s):
