Practice Exam 3

1. (0 points) Find the directional derivative of $f(x,y) = \sec(xy)$ at the point $(1, \frac{\pi}{4})$ in the direction $\mathbf{v} = <1, -2>$

2. (0 points) Find all local extrema and saddle points of the function $f(x,y) = x^3 - 3xy + y^3$.

3. (0 points) Use the method of Lagrange multipliers to find the maximum and minimum values of the function f(x,y)=2xy on the circle $x^2+y^2=18$

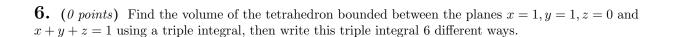
4. (0 points) Sketch the solid whose volume is given by

$$\int_0^5 \int_{-\sqrt{25-x^2}}^{\sqrt{25-x^2}} (5-\sqrt{x^2+y^2}) dy dx$$

5. (0 points) Evaluate each of the following: a) $\int_0^1 \int_y^1 e^{x^2+1} dx dy$

b)
$$\int_0^{\pi/2} \int_0^{\sin x} \sin(\cos x) dy dx$$

c)
$$\int_{-2}^{2} \int_{0}^{\sqrt{4-x^2}} \sin^2 \sqrt{x^2 + y^2} dy dx$$



7. (0 points) Set up, but do not evaluate a triple integral in cylindrical coordinates for the volume of the solid that lies above the paraboloid $z = x^2 + 2y^2 - 2$ and below the paraboloid $z = -3x^2 - 2y^2 + 2$.

8. (0 points) Set up, but do not evaluate a triple integral in spherical coordinates for the volume of the solid that lies inside the sphere $x^2 + y^2 + z^2 = 4$, bounded by the cones $z = \sqrt{x^2 + y^2}$, $z = -\sqrt{x^2 + y^2}$ and the planes x = 0, y = 0.

- **9.** (0 points)
- a) Find the Jacobian $\frac{\partial(x,y)}{\partial(u,v)}$ for the transformation $x=u^2v+v^2, y=uv^2-u^2$.

b) Evaluate $\iint_R (3x-y)^{3/2} (x+y)^5 dA$ where R is the parallelogram bounded by y=-x, y=-x+1, y=3x and y=3x-1. Use the change of variables u=3x-y, v=x+y.