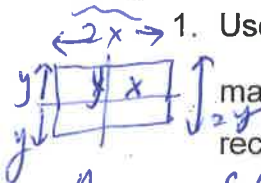


Math 173 Exam 2 – Review

Sample Problems – These are meant to be representative of the level of difficulty of what might be on an exam – it's a small sample, not meant to be an all-inclusive list of problem types.

1. Use the method of LaGrange multipliers to find the dimensions of the rectangle of maximum area that can be inscribed in the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$, where the rectangle's sides are parallel to the coordinate axes.



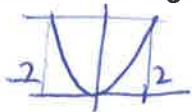
Area = $f(x, y) = 4xy$, $x = 2\sqrt{2}$, $y = 3/\sqrt{2}$, $f(2\sqrt{2}, 3/\sqrt{2}) = 24$

2. Evaluate $\iint_R 2e^{4x+2y} dA$ where $R = [0, 1] \times [0, 1]$

$\frac{e^6 - e^4 - e^2 + 1}{4}$

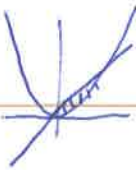
3. Calculate the volume of the solid bounded by $z = \sqrt{x^2 + y^2}$ and $z = 4$. $64\pi/3$

4. Sketch the region and change the order of integration for $\int_0^2 \int_{x^2}^4 f(x, y) dy dx$



$\int_0^4 \int_0^{\sqrt{y}} f(x, y) dx dy$

5. Consider a thin lamina in the xy-plane, bounded by the line $y = x$, and the parabola $y = x^2$, with a density function $\rho(x, y) = e^{x^2+y^2}$



Set up the integrals for the following quantities, but DO NOT INTEGRATE.

- a. The center of mass
b. The moment of inertia about the x-axis.

a) $\bar{x} = \frac{\int_0^1 \int_{x^2}^x x e^{x^2+y^2} dy dx}{\int_0^1 \int_{x^2}^x e^{x^2+y^2} dy dx}$ *y similar with y*

b) $\int_0^1 \int_{x^2}^x y^2 e^{x^2+y^2} dy dx$

6. Evaluate the surface area of the portion of $z = xy$ inside $x^2 + y^2 = 8$, in the first octant.

$13\pi/3$

7. Evaluate $\iiint_E 4x dV$ where E is the region below $z = \sqrt{x^2 + y^2}$, above $z = 0$, and inside $x^2 + y^2 = 4$. 0

8. Evaluate $\int_{-1}^1 \int_0^{\sqrt{1-x^2}} \int_{\sqrt{x^2+y^2}}^{\sqrt{2-x^2-y^2}} \sqrt{x^2 + y^2 + z^2} dz dy dx$ using spherical coordinates.

$\pi(1 - \sqrt{2}/2)$