Math 253 Exam 3 Name________________________
Nov.30, 2018

(12.5 pts. ea.)

1. Use Lagrange multipliers to find the maximum and minimum values, if these exist, of $f(x, y, z) = xyz$ subject to the constraint $4x^2 + y^2 + 2z^2 = 12$.

2. Find the volume of the solid enclosed between the surfaces $z = y^3 + xy$ and $z = -2$, and bounded by the curves $y = 0$, $y = \sqrt{x}$, and $x = 4$.

3. Change the order of integration to evaluate $\int_0^1 \int_{x^2}^1 \sqrt{y}\,\sin\left(y^2\right)\,dy\,dx$

4. Use polar coordinates to evaluate $\iint_R \sqrt{4+x^2+y^2}\;dA$ where R is the region that lies to the right of the y-axis, and between the circles $x^2+y^2=1$ and $x^2+y^2=16$.

5. Find the area of the part of the plane $2x+3y+z=8$ that lies above the triangle with vertices $(0,0)$, $(2,0)$, and $(0,2)$.

6. Use cylindrical coordinates to evaluate $\iiint_E e^z \, dV$ where E is enclosed by the paraboloid $z = x^2 + y^2$, the cylinder $x^2 + y^2 = 9$, and the x-y plane.

7. Set up the triple integral of an arbitrary function $f(x, y, z)$ in spherical coordinates over the indicated solid.

8. Evaluate the line integral $\int_C yz\,dx + xz\,dy + (xy + 2z)dz$, where C is the line segment from $(1, -1, 0)$ to $(2, 3, 1)$

(a) by calculating a line integral;

(b) by using the Fundamental theorem for line integrals.