

Math 2233 Practice Midterm 2

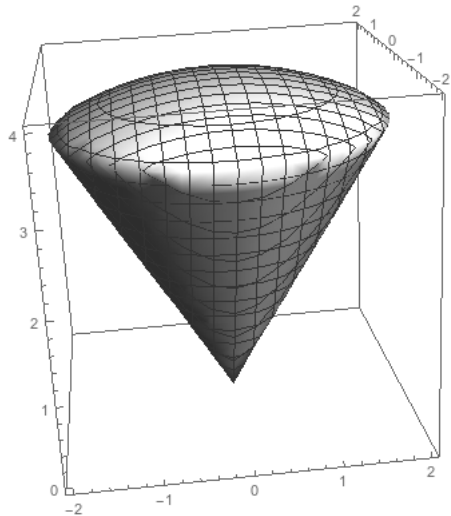
Instructor: Jay Daigle

- Problem 1.** (a) Find the maximum and minimum values of $f(x, y) = 20 - 4x^2 - y^2$ on the disk $x^2 + y^2 \leq 4$.
- (b) Find a parametrization for the cone, opening in the direction of the x axis, with total inner angle $\pi/2$.

- Problem 2.** (a) Find the volume of the region bounded by the planes $x = 3$, $x = 6 - y - z$, and $y = 0$, $z = 0$.
- (b) Compute the integral of the function $f(x) = x + 3y$ over the region bounded by $x + 3y = 0$, $x + 3y = 3$, $x - 3y = 0$, $x - 3y = 2$. (Hint: reparametrize to get a rectangle).

Problem 3. Let R be the spherical wedge bounded by a sphere of radius 4 centered at the origin, and the cone given by $z = \sqrt{3x^2 + 3y^2}$ (as shown below). Let $f(x, y, z) = z$.

- (a) Set up integrals to compute $\int_R f \, dA$ in cartesian, cylindrical, and spherical coordinates.
- (b) Choose one of these integrals and evaluate it.



- Problem 4.** (a) Find a parametric equation for a particle moving in a straight line from $(1, 2, 2)$ to $(-3, 1, 5)$
- (b) Suppose another particle follows the path $\vec{r}_2(t) = (t, t^2, 2 - t)$. Does this particle's path intersect the path of the particle from part (a)?
- (c) Find a flow line for the vector field $\vec{F}(x, y) = x\vec{i} + 1\vec{j}$ that goes through the point $(1, 1)$.