1 Exam 2 Review Problems

1. Find the smallest distance from the origin to the surface $x^2y - z^2 + 9 = 0$
2. Find the area of the cardiod $r = 6 - 6sin\theta$
3. Find the surface area of the surface of $z^2 + y^2 = 9$ in the first octant between the planes $x = y$ and $y = 3x$
4. Find the shape of the rectangular box of volume V_0 such that the sum of the lengths of the edges is minimized.
5. If $F(u, v) = arctan(uv)$ where $u = \sqrt{xy}$ and $v = \sqrt{x} - \sqrt{y}$, find $\frac{\partial F}{\partial x}$ and $\frac{\partial F}{\partial y}$
6. Find the shape of the rectangular box of maximum volume where the sum of the lengths of the edges is S_0
7. Find the equation of the tangent plane to $x^2 + y^2 - 5z^3 = 10$ at $(5, 5, 2)$
8. Find the minimum and maximum values of $z = y^2 - x^2$ on the closed triangle with vertices $(0, 0), (1, 2)$ and $(2, -2)$
9. Find the center of mass of the lamina with density $\delta(x, y) = xy^2$ bounded by the lines $x = 1 \quad x = 3 \quad y = 0 \quad y = 2$
10. In what direction is $f(x, y) = 8x^3 - 9y^2$ increasing most rapidly?
11. Change the order of integration: $\int_0^1 \int_0^{arccos(y)} f(x, y)\ dx\ dy$
12. Evaluate $\iint_S \frac{1}{x^2+y^2}\ dA$, where S is the region between $x^2 + y^2 = 4$ and $x^2 + y^2 = 9$
13. Find the maximum and minimum of $f(x, y) = x^2y^3$ such that $x^2 + y^2 = 1$
14. Evaulate $\int_{-2}^{2} \int_{-\sqrt{4-y^2}}^{\sqrt{4-y^2}} 2xy^2\ dx\ dy$
15. Find the maximum and minimum of $f(x, y) = \sqrt{x}(y + 1)^2$ such that $x^2 + y^2 = 1$
16. Find the moments of intertia $I_x\ I_y\ I_z$ for the lamina bounded by $y = x^2 \quad y = 4$ with density given by $\delta(x, y) = y$
17. Evaluate $\int_0^1 \int_x^1 x^2\ dy\ dx$ using polar coordinates