jMATH 353
Handout #2

1. Find absolute extrema of $f(x,y) = \frac{1}{8}x^3 + y^3$ on the circle $x^2 + y^2 \le 65$

2. Find the absolute extrema of $f(x,y) = x^2 + y^2$
   on the surface $S = \left\{ \frac{1}{8}x^3 + y^3 = 65, x \ge 0, y \ge 0. \right\}$.

3. Find absolute maxim and minima of $f(x,y) = 2y^2 - x + x^2$
   inside and on the triangle T with vertices $O(0,0)$, $A(1,1)$, $B(1,-1)$.

4. Find the point on the plane $x - 2y - z = 3$ closest to the point $P\,(1,-1,2)$.
   Justify!

5. Find absolute maximum of $f(x,y,z) = xyz$ for $x,y,z \ge 0$
   on the surface $2xy + 2xz + 3yz = 144.$
   (You may assume that there is an absolute maximum).

6. (a) Evaluate $\int_1^3 \left(\int_{-x}^{x^2} x e^{2y} dy \right) dx.$

   (b) Switch the order of integration in the integral above and sketch the region D.

7. Evaluate $\iint_D \sqrt{2 - x^2} dA$ where D is smaller region between $y = x^2$ and $x^2 + y^2 = 2.$
   and sketch the region

8. Switch the order of integration in the integral $\int_0^{\frac{\pi}{4}} \left(\int_0^{\tan x} f(x,y) dy \right) dx.$

9. For $\iint_D \frac{1}{x^2 + y} dA$ where D is the region between the x-axis and $y = 4 - x^2$
   sketch the region D and set up BOTH iterated integrals and evaluate one of them.
   (Hint: $\lim_{x \to 0^+} x \ln x = 0$).

10. Calculate the volume of the solid below the surface $z = e^{(y-1)^2}$ and above the triangle$T$ with vertices
    $A\,(-1,0)\,, B\,(0,1)\,, C\,(2,0)$ with vertical sides.