

**MATH 353**  
**Handout #2**

1. Find absolute extrema of  $f(x, y) = \frac{1}{8}x^3 + y^3$  on the circle  $x^2 + y^2 \leq 65$
2. Find the absolute extrema of  $f(x, y) = x^2 + y^2$   
on the surface  $S = \left\{ \frac{1}{8}x^3 + y^3 = 65, x \geq 0, y \geq 0 \right\}$ .
3. Find absolute maximum 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  $x, y, z \geq 0$   
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  $\int \int_D \sqrt{2 - x^2} dA$  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  $\int \int_D \frac{1}{x^2 + y} dA$  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:  $\lim_{x \rightarrow 0^+} x \ln x = 0$ ).
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.