MATH 353 L01, L02 W 2010

HANDOUT 2

1. Find the absolute extrema of $f(x,y) = (1/8)x^3 + y^3$ on the disk $x^2 + y^2 \leq 65$.

2. Which of the following domains in $\mathbb{R}^3$ is compact?
   (a) $D_a = \{(x,y,z) : x^2 + 4y^2 + 9z^2 \leq 36\}$.
   (b) $D_b = \{(x,y,z) : x^2 + 4y^2 + 9z^2 = 36\}$.
   (c) $D_c = \{(x,y,z) : x^2 - 4y^2 + 9z^2 = 36\}$.
   (d) $D_d = \{(x,y,z) : x^2 - 4y^2 - 9z^2 = 36\}$.
   (e) $D_e = \{(x,y,z) : 1 \leq x, y, z^3 \leq 8\}$.

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

4. Section 13.3-20. A box has one vertex at the origin, the diagonally opposite vertex on the surface $xy + 2yz + 3xz = 18$, $x, y, z \geq 0$, and all its edges parallel to the coordinate axes. Find the largest possible volume for the box.

5. Section 13.3-14. Find the maximum and minimum values of $f(x,y,z) = x + y^2 z$ subject to the constraints $y^2 + z^2 = 2$ and $z = x$.

6. Section 13.3-22. Find the absolute maximum and absolute minimum of $f(x,y,z) = xy + z^2$ on the unit ball $x^2 + y^2 + z^2 \leq 1$.

7. (a) Evaluate $\displaystyle\int_1^3 \int_{-x}^{x^2} x e^{2y} dy dx$.
   (b) Write (a) as an iterated integral in the order $dxdy$.

8. Evaluate $\displaystyle\int\int_D \sqrt{2 - x^2} dA$, where D is the smaller region between $y = x^2$ and $x^2 + y^2 = 2$.

9. Section 14.2-16. Evaluate $\displaystyle\int_0^{\pi/2} \int_y^{\pi/2} \frac{\sin x}{x} dx dy$.

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