136.272

Assignment 4 (Sections 15.8, 16.1-16.4)

Due: Monday, Dec.5, 2005 in class.

1. [6 marks] Use the method of Lagrange multipliers to find and classify the extrema of the function $f(x,y) = xy$ subject to the constraint $x^2 + y^2 - 4 = 0$.

2. [6 marks] Evaluate $\iint_D (4xy^3 - 4x^2y)dA$ where D is the region bounded by $y = -\sqrt{1-x^2}$, $y = \sqrt{1-x}$ and $y = \sqrt{1+x}$. Sketch D.

3. [7 marks] Find the volume V of the solid S bounded by the xy-plane, the cylinder $y = x^2$, and the planes $z = x + 2y$ and $y = 2x + 8$. Sketch S.

4. [6 marks] Use double integrals and polar coordinates to find the area **in the first quadrant** between the lemniscate $r^2 = \cos 2\theta$ and the four-leaf rose $r = \cos 2\theta$.