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March 12, 2015
MAC 2313.3122
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Quiz 8
You must show all work to receive full credit!!

Problem 1. (4 pts) Evaluate the iterated integral $\int_2^6 \int_1^4 y^2 dx dy$.

$\int_1^4 y^2 dx = y^2 x \Big|_{x=1}^{4} = y^2(4-1) = 3y^2$, so

$\int_2^6 \int_1^4 y^2 dx\, dy = \int_2^6 3y^2 dy = y^3 \Big|_2^6 = 216 - 8 = \boxed{208}$

Problem 2. (6 pts) Use the method of Lagrange multipliers to find the minimum and maximum values of the function $f(x,y) = 2x + 4y$ subject to the constraint $x^2 + y^2 = 5$.

$\nabla f = \langle 2, 4 \rangle$ $\quad g(x,y) = x^2+y^2-5 \Rightarrow \nabla g = \langle 2x, 2y \rangle$.

Then $\nabla f = \lambda \nabla g \Rightarrow \begin{cases} 2 = 2x\lambda \\ 4 = 2y\lambda \end{cases} \Rightarrow \lambda = \frac{1}{x} = \frac{2}{y} \Rightarrow y = 2x$

(can divide since $(0,0)$ not on constraint curve)

Sub into constraint: $x^2 + (2x)^2 = 5 \Rightarrow x^2 + 4x^2 = 5 \Rightarrow 5x^2 = 5$

$\Rightarrow x^2 = 1 \Rightarrow x = \pm 1$, so critical points are $(1,2)$, $(-1,-2)$.

$f(1,2) = 2 + 8 = \boxed{10 : \text{maximum}}$

$f(-1,-2) = -2 - 8 = \boxed{-10 : \text{minimum}}$