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Quiz 8
You must show all work to receive full credit!!

Problem 1. (4 pts) Evaluate the iterated integral $\int_{-2}^{1}\int_{0}^{\pi/2} x^2\cos(y)dydx$.

$$\int_{-2}^{1}\int_{0}^{\pi/2} x^2\cos y\,dy\,dx = \int_{-2}^{1} x^2\sin y\Big|_{y=0}^{\pi/2} dx = \int_{-2}^{1} x^2(1-0)\,dx$$

$$= \int_{-2}^{1} x^2dx = \frac{1}{3}x^3\Big|_{-2}^{1} = \frac{1}{3}(1+(+8)) = \frac{1}{3}(9) = \boxed{3}$$

Problem 2. (6 pts) Use the method of Lagrange multipliers to find the minimum and maximum values of the function $f(x,y) = 4x+6y$ subject to the constraint $x^2+y^2 = 13$.

$\nabla f = \langle 4, 6\rangle$, $\nabla g = \langle 2x, 2y\rangle$ so $\lambda\nabla g = \nabla f$ implies

$$\begin{cases} 4 = 2\lambda x \\ 6 = 2\lambda y \end{cases} \Rightarrow \lambda = \frac{2}{x} = \frac{3}{y} \Rightarrow 2y = 3x \Rightarrow y = \frac{3}{2}x$$

(ok since $x\neq 0$, $y\neq 0$)

Sub into constraint: $x^2+\left(\frac{3}{2}x\right)^2 = 13 \Rightarrow x^2+\frac{9}{4}x^2 = 13 \Rightarrow \frac{13}{4}x^2 = 13$

$\Rightarrow x^2 = 4 \Rightarrow x = \pm 2$, so critical points are $(2,3)$, $(-2,-3)$.

$f(2,3) = 4(2)+6(3) = 8+18 = \boxed{26}$ max

$f(-2,-3) = 4(-2)+6(-3) = -8-18 = \boxed{-26}$ min