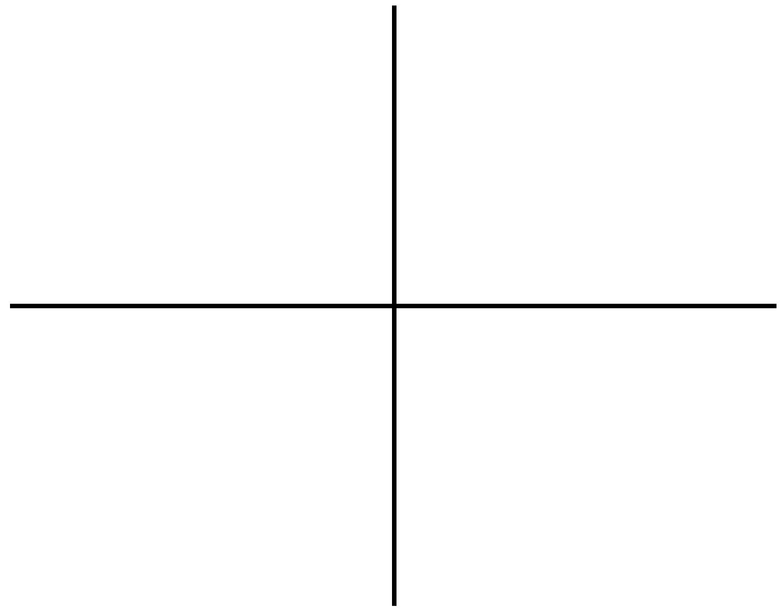
SI Session: Exam II Review
Mondays: 4:50 PM – 6:20 PM
Tuesdays: 1:30 PM – 3:00 PM
Wednesdays: 4:50 PM – 6:20 PM
Room 1245 SNAD

Prof. Stockton : Calculus III
Spring 2009
SI Leader : Neil Jody

[1] Let $f\left(x,y\right)=4x^2+9y^2$.

(a) Sketch the level curve of f containing the point $\left(0,-2\right)$.

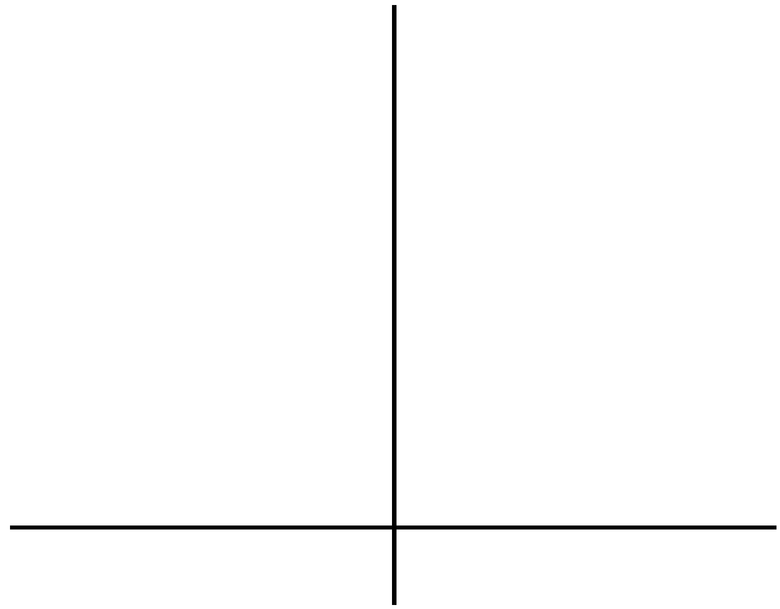


(b) Find the *unit* vector which points in the direction in which f *decreases* most rapidly at $\left(0,-2\right)$.

[2] Find an equation of the plane tangent to the surface $x^2 + yz^3 = 4$ at the point $(-1,3,1)$.

[3] Find the directional derivative of the function $f(x,y,z) = xyz$ at the point $(1,2,-2)$ in the direction from $(1,2,-2)$ to $(-1,0,-1)$.

[4] Find the absolute extrema of the function $f(x,y) = x^2 + y^2 - 6y$ on the closed region bounded by the graphs $y = 4 - x^2$ and $x + y = 2$.



[5] Use Lagrange Multipliers to find the maximum and minimum of the function $f\left(x,y,z\right)=x+y+z$ on the sphere $x^2+y^2+z^2=4$.

[6] Let $f\left(x,y,z\right)=x\ln y+y^2\sin\left(xz\right)$. Calculate f_{yxy}.

[7] Evaluate the integral $\int_1^2 \int_0^{\sqrt{4-x^2}} \frac{x}{x^2 + y^2}\, dydx$ by first converting to polar coordinates.

[8] Let $z = x^2 + xy$, $x = rs + 2t$, $y = r^2 - st$. Calculate z_r when $r = 1$, $s = -2$, and $t = 3$.

[9] Let $f(x,y)=6x^2-2x^3+3y^2+6xy$. Find all relative extrema and saddle points for f.

[10] Let D be the triangular region in the xy-plane bounded by the graphs of $x+y=6$, $y=2x$, and $5y=x$. Using the change of variables $x=5u+v$ and $y=u+2v$, express the integral $\iint_D (5y-x)e^{y-2x}\,dxdy$ as an iterated integral in the variables u and v. Do not evaluate the integral.

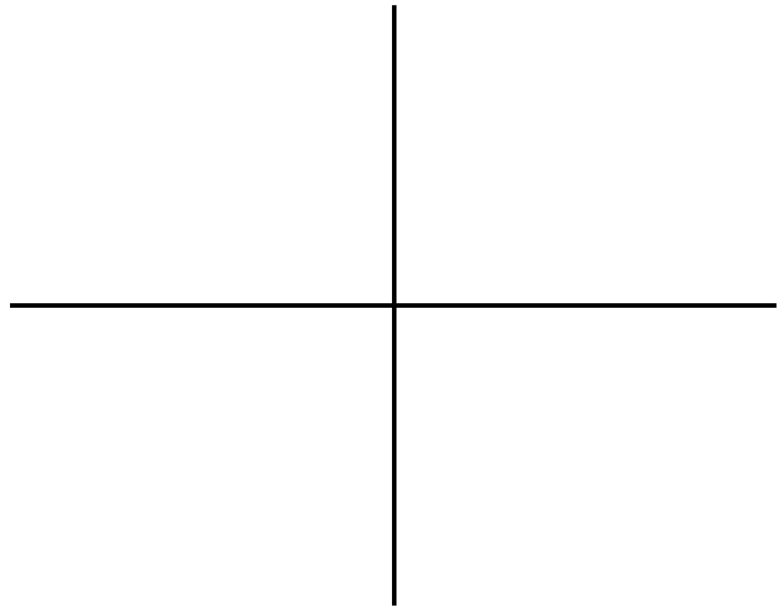
[11] Let D be the region in the xy-plane bounded by the x-axis, the y-axis, the line $y=1$, and the curve $y=\ln x$. Express $\iint_D f(x,y)\,dA$ as an iterated integral. Do not evaluate the integral.

[12] Express $\int_0^1 \int_3^{4-x^2} f(x,y)\,dy\,dx$ as an iterated integral with the reverse order of integration.

[13] Let D be the region in the xy-plane bounded by the lines $y = 3x$, $2y = x$, and $x = 4$. Using the change of variables $x = u - 2v$ and $y = 3u - v$, evaluate $\iint_D (y - 3x)\,dy\,dx$.

[14] Let D be the region in the xy-plane bounded by the lines $x+2y=2$, $y=x+1$, and $y=-2x+4$. Use the change of variables $x=u+2v$ and $y=u-v+1$ to evaluate the integral $\iint_D (x-y)dA$.

[15] Evaluate the integral $\int_{-2}^{2}\int_{0}^{\sqrt{4-y^2}} \sin(x^2+y^2)\,dx\,dy$ by first converting to polar coordinates.



[16] Let D be the region in the xy-plane bounded on the left by the y-axis, above by the graph of $x^2 + y^2 = 4$ and below by the line $y = 1$.

Evaluate $\iint_D \frac{1}{\left(x^2 + y^2\right)^{\frac{3}{2}}} \, dxdy$ by converting to polar coordinates.