SI Session: March 23rd, 24th, & 25th, 2009
Mondays: 4:50 PM – 6:20 PM
Tuesdays: 1:30 PM – 3:00 PM
Wednesdays: 4:50 PM – 6:20 PM
Room 1245 SNAD

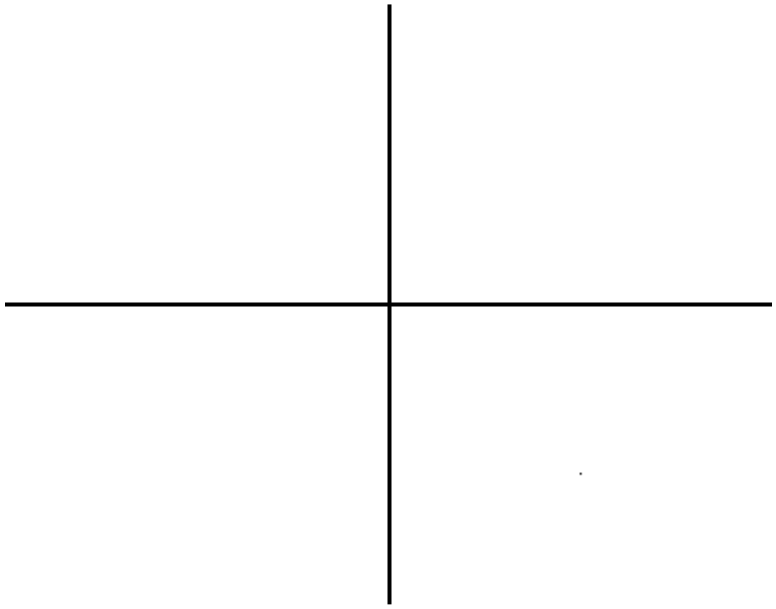
Prof. Stockton : Calculus III
Spring 2009
SI Leader : Neil Jody

[1] Find all points on the surface $xy - 2x + z^2 = 8$ at which the plane tangent to the surface is parallel to the plane with equation $x + y - 2z = 3$.

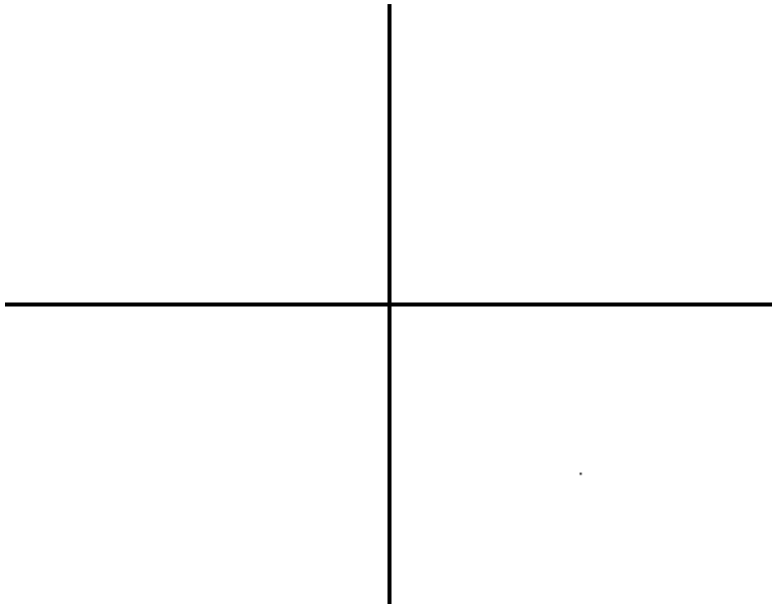
[2] Find the absolute extrema of the function over the region R. In each case, R contains the boundaries.

(a) $f(x,y) = (2x - y)^2$

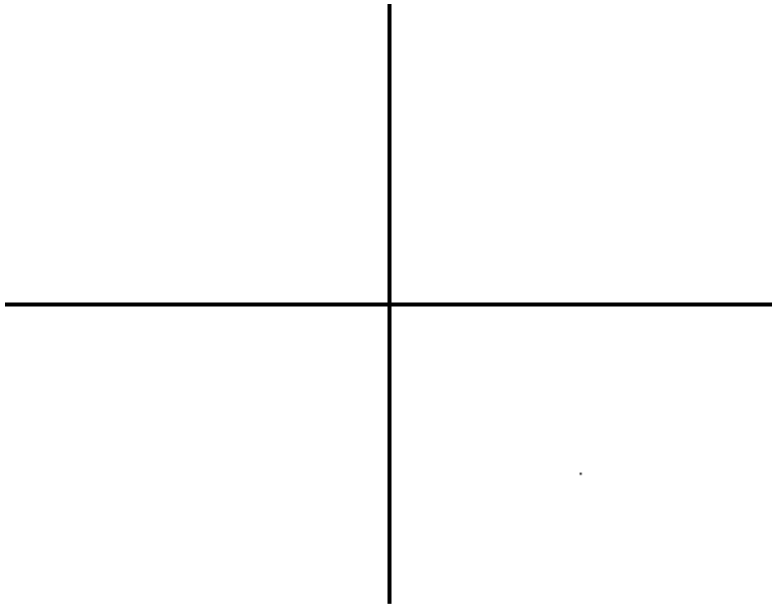
R: The triangular region in the xy-plane with vertices $(2,0)$, $(0,1)$, and $(1,2)$.



(b) $f(x,y) = x^2 - 4xy + 5,\ R = \left\{(x,y) : 0 \le x \le 4, 0 \le y \le \sqrt{x}\right\}$



(c) $f(x,y)=\dfrac{4xy}{\left(x^2+1\right)\left(y^2+1\right)}$, $R=\left\{(x,y): x\geq 0, y\geq 0, x^2+y^2\leq 1\right\}$

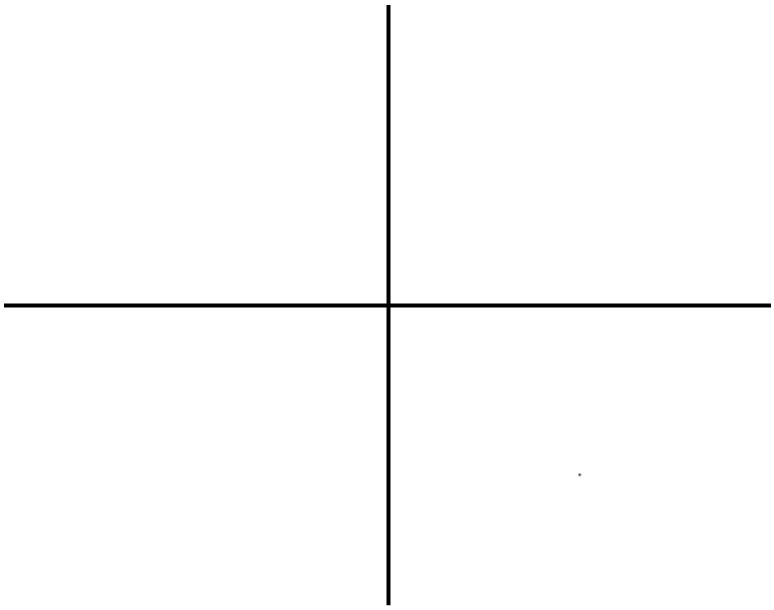


[3] For each of the following functions, find all local extrema and saddle points.

(a) $f(x,y) = x^3 - 4xy + 2y^2 - 1$

(b) $g(x,y) = x^2 - 4xy + y^3 + 4y$

[5] Find the maximum and minimum values of the function $g(x,y) = x^2 + y^2 - x - y + 1$ on the unit disk $x^2 + y^2 \leq 1$.



[6] The function $f(x,y,z) = 2x^2 + y^2 + 3z^2$ has a minimum value on the plane $2x - 3y + 4z = 49$. Find this minimum value.

[7] A spider living in a two-dimensional world finds itself in a toxic environment. The toxicity at (x, y) is given by the function $T(x, y) = 4x^2 - 4xy + y^2$.

(a) If the spider is at the point $(-2, 1)$, in which direction should it move in order to *lower* the toxicity the fastest?

(b) Use Lagrange multipliers to determine the points along the parabola $y = x^2$ at which the toxicity is the lowest.

[8] Use Lagrange multipliers to find the *maximum* value of the function $f(x,y,z) = 2xy + 3z^2$ on the sphere $x^2 + y^2 + z^2 = 4$.