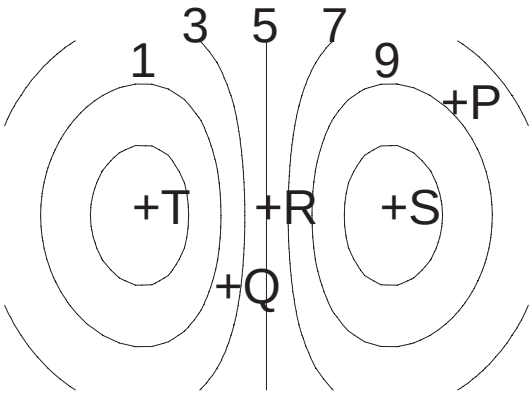
MAC 2313 Calculus 3 **Test 3** 6 Oct 2004

Directions: Show **ALL** work for credit; Give **EXACT** answers when possible; Start each problem on a **SEPARATE** page; Use only **ONE** side of each page; Be neat; Leave margins on the left and top for the **STAPLE**; Calculators can be used for graphing and calculating only; Nothing written on this page will be graded;

1. Find the equation of the tangent plane to $F(x, y, z) = 0$ at the point $(5, -3, 4)$ when F is given by $x^2 + yz - 13$.

2. A contour plot of the function $f(x, y)$ is given below. Find the sign (positive, negative or zero) of the partial derivatives below by completing a table like the one below the graph. The location of the point is at the center of the plus sign to the left of the label.



	P	Q	R	S	T
f_x					
f_y					
f_{yy}					

3. Use the chain rule (as shown in class) to find $\partial z/\partial s$ and $\partial z/\partial t$ if $z = x/y + \cos(x - y)$, $x = \sqrt{s^2 + t^2}$ and $y = e^{st}$

4. Find the directional derivative of $f(x, y) = \sin(x)\sin(y)$ as leave the point $P = (\pi/4, \pi/6)$ heading in the direction of the point $Q = (\pi/2, \pi/3)$. Exact simplified answer please.

5. (a) Find all points (x, y) so that both $(x - 5)(x + y) = 0$ and $(x - 3)(y + 1)(x - 3y - 8) = 0$.

   (b) Copy and complete the table below

Points	f_{xx}	f_{yy}	f_{xy}	D	classification
$(1, 3)$	2	4	3		
$(2, 5)$	2	4	-2		
$(5, 0)$	-2	3	0		
$(-1, 4)$	0	3	1		
$(-2, -2)$	-3	-20	5		