

## MAT 275

September 18, 2007

Please answer the following questions Maple and hand in your Maple worksheet. Type your name(s) at the top of the page and number each of the problems. Use the following Maple commands for this worksheet:

**with(plots);**

```
f:= f(x,y);  
contourplot(f,x=x1..x2,y=y1..y2);  
plot3d(f,x=x1..x2,y=y1..y2,axes=normal,style=patchcontour);  
f1:=subs(y=m*x,f);  
plot(subs(m=1,f1),x=x1..x2);
```

1. Consider the function from class:

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

- (a) Use *contourplot*, as described above, to plot the level curves.
- (b) Use *plot3d*, as given above, to graph it. Rotate the graph until you get a view of the level curves similar to that in (a).

2. Consider the function

$$f(x, y) = x^2 + 4y^2.$$

- (a) Use *contourplot* to plot the level curves.
- (b) Use *plot3d* to graph it, and rotate until you get a view of the level curves similar to that in (a).

3. Consider the function

$$f(x, y) = (x^2 + 3y^2)e^{1-x^2-y^2}$$

- (a) Use *contourplot* to plot the level curves.
- (b) Use *plot3d* to graph it, and rotate the graph until you get a view of the level curves similar to that in (a).

4. Consider the function

$$f(x, y) = \frac{xy}{\sqrt{x^2 + y^2}}.$$

- (a) Use *plot3d* to graph it, and rotate until you get a view of the region where  $(x, y) = (0, 0)$ . As  $x$  and  $y$  approach 0 does  $z = f(x, y)$  appear to have a limit?
- (b) Now specify a very small ranges such as  $-0.001 < x < 0.001$ . Does  $z$  appear to have a limit as  $(x, y) \rightarrow (0, 0)$ ?
- (c) Investigate the limit of the function further by looking at graphs of the functions along the line  $y = mx$ , i.e. substitute  $y = mx$  into  $f(x, y)$  using the *subs* command.

- (d) Now that you've substituted  $y = mx$  into  $f(x, y)$ , the resulting function  $f1$  is a function of one variable  $x$ . Make multiple graphs of  $f1$  by substituting two or more different values of  $m$ , see *plot* command above.
- (e) Look at your 2-D plots for different values of  $m$ , does there appear to be a limit as  $x$  approaches 0?