

## CS 206 Homework 7

Your name:

Due: Thursday, December 8.

[ >

### **Instructions**

These problems use material from Sections 5.6 and 5.7 from Worksheet 5.

Do all of your work in this Maple worksheet. If you are asked to explain something, type your explanation in this worksheet. Do not give the most terse answer that you can think of. Give a full explanation of whatever is being asked. Your explanations should be clear, well written, and make use of proper spelling, punctuation, grammar, etc. Make your solutions and explanations as presentable as possible. Make use of Maple's basic formatting and word processing abilities. (Do not put your explanations on a Maple command line after a prompt.)

If you need to do a calculation, you should use Maple to do the calculation here in this worksheet. Do not do a calculation on a handheld calculator and then copy the result into this worksheet.

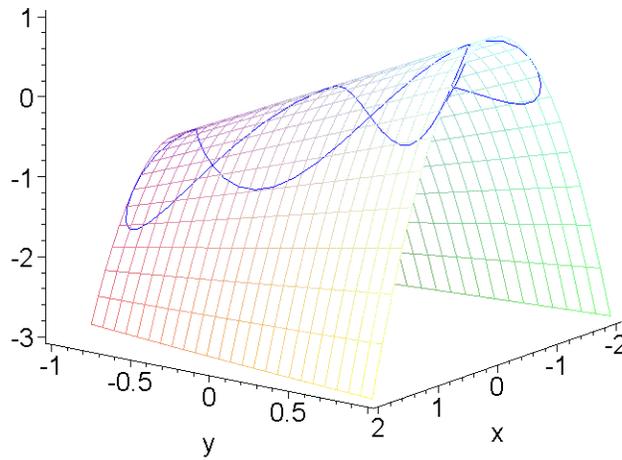
If you need more Maple prompts for commands, use Ctrl-j to create a new prompt.

Be sure to save your worksheet (as a "classic worksheet") as you work on it.

[ >

### **Problem 1**

Use Maple to reproduce the following graph as accurately as possible. In particular, notice that the "bottom edge" of the graph is parallel to the horizontal  $xy$ -plane. Explain how you get the graph to have this property and also explain how you get the graph of the curve to lie in the graph of the surface. The surface is the graph of the function  $f(x, y) = y - x^2$ . The curve on the surface has the parameterization  $g(t) = (\cos(3t), \sin(2t))$ .

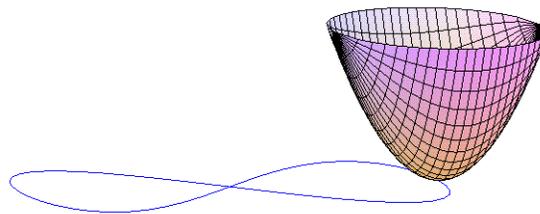


[ >

[ >

## **Problem 2**

Use a `plot3d`-valued-function with the `seq` and `display` commands to create the following animation. This is an animation of the graph of the function  $f(x, y) = x^2 + y^2$  with its minimum point translated along the parametric curve  $g(t) = (2 \cos(2 \pi t), \sin(4 \pi t))$ . The paraboloid is drawn over a non-rectangular region. The non-rectangular region is a disk of radius one with its center translated along the graph of  $g(t)$ .



To create this animation, first define a `plot3d`-valued function `p` with two parameters, `a`, `b`. The `plot3d`-valued function should draw a graph of the function  $f(x, y)$  with its minimum translated to the point `(a, b)`. First get this translation to work (draw the paraboloid over a square region that is translated to have its center at the point `(a, b)`). Test your `plot3d`-valued function. When it draws

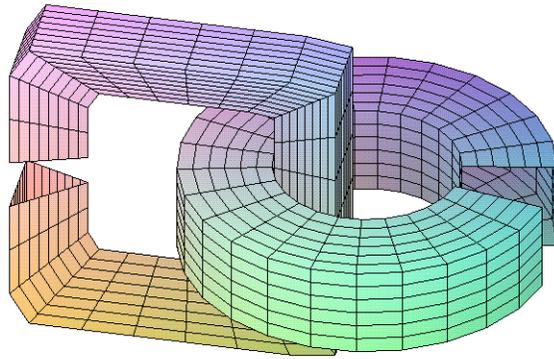
the correct graph, make the `plot3d`-valued function draw the graph of  $f(x, y)$  over a non-rectangular region that is a disk of radius one centered at the point  $(a, b)$ .

After your `plot3d`-valued function is correct, define the parametric function  $g(t) = (2 \cos(2 \pi t), \sin(4 \pi t))$ . Then create a `seq` command that draws the `plot3d`-valued function `p` composed with `g` (so that the paraboloid gets moved around the parametric graph of `g`). Finally, the blue figure eight curve is a "background image" that is the graph of the function  $h(t) = (2 \cos(2 \pi t), \sin(4 \pi t), 0)$ .

```
[ > p := (a,b) -> plot3d(    );  
[ > g := t ->    ;  
[ > seq(    ):  
[ > fg := plots[display](%, insequence=true):  
[ > bg := plots[spacecurve](    color=blue ):  
[ > plots[display]( fg, bg );  
[ >  
  
[ >
```

### Problem 3

Use parametric surfaces to create the following graph.



[ >

[ >