

The attached figure shows the contours of the **temperature along one wall of a heated room** through one winter day, with **time indicated as on a 24-hour clock**. Use this information to answer the questions below:

- The room has a **heater** located at the left-most corner of the wall
- The room has one **window** in the wall
- The heater is controlled by a thermostat about 2 feet from the window

1. Where is the window?
2. When is the window open?
3. When is the heat on?
4. Draw graphs of the temperature along the wall of the room at 4am, at noon, at 4 pm (16 hours) and at 8pm (20 hours).
5. Draw a graph of the temperature as a function of time at the heater, at the window, and midway between them.
6. The temperature at the window at 5 pm (17 hours) is less than at 11am. Why do you think this might be?
7. To what temperature do you think the thermostat is set? How do you know?
8. Where is the thermostat?

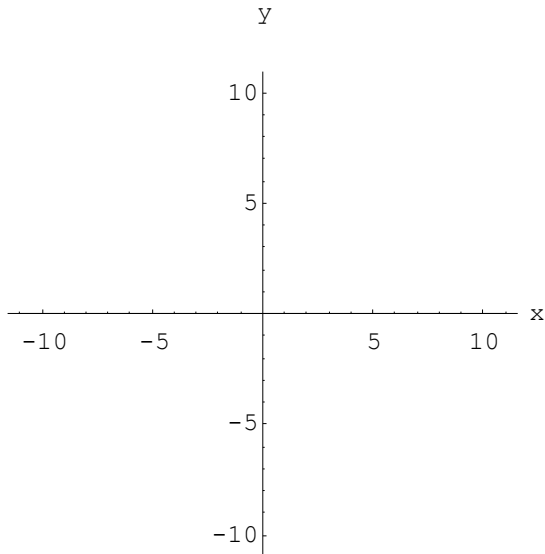
1. Let  $f(x,y) = \sqrt{100 - x^2 - y^2}$ .

(a) Below, sketch and label the curve consisting of all points  $(x,y)$  such that  $f(x,y) = 0$ .

(b) Do the same for the curve such that  $f(x,y) = 8$ , for the curve such that  $f(x,y) = 9$ , and for the "curve" such that  $f(x,y) = 10$ .

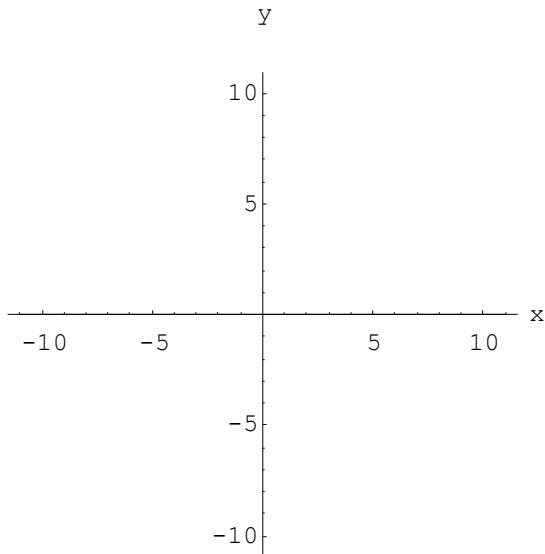
(c) Describe the domain of  $f$ .

(d) Sketch the surface defined by the equation  $z = \sqrt{100 - x^2 - y^2}$  (i.e. graph of  $f(x,y)$ ).



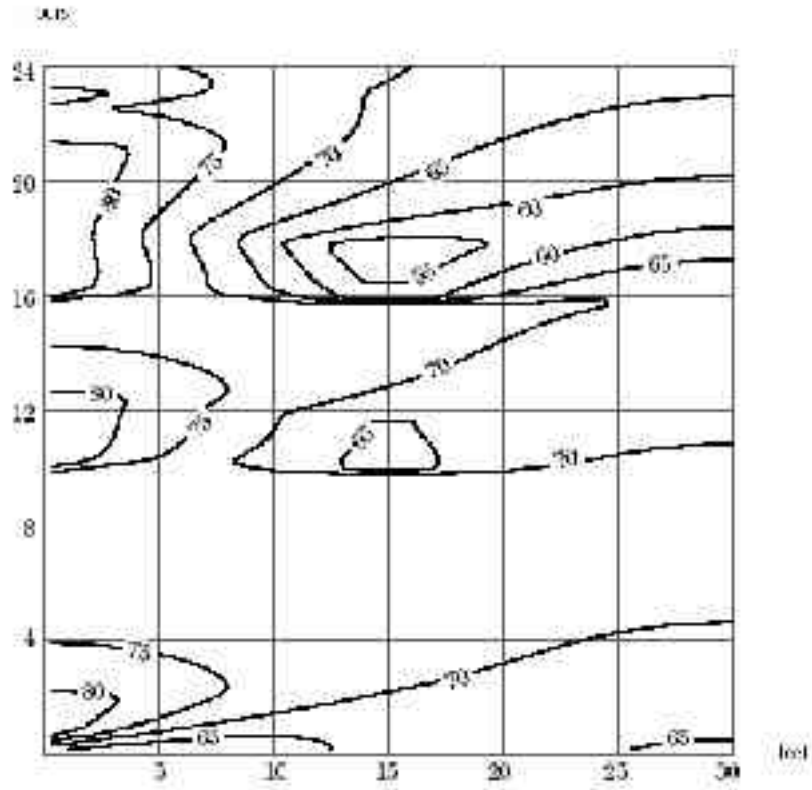
2.

(a) Sketch a contour diagram for  $g(x,y) = 10 - \sqrt{x^2 + y^2}$  and label at least four contours.



(b) How does the separation between the contours here compare with the separation in the previous problem? What does this tell you about the "steepness" of the surface

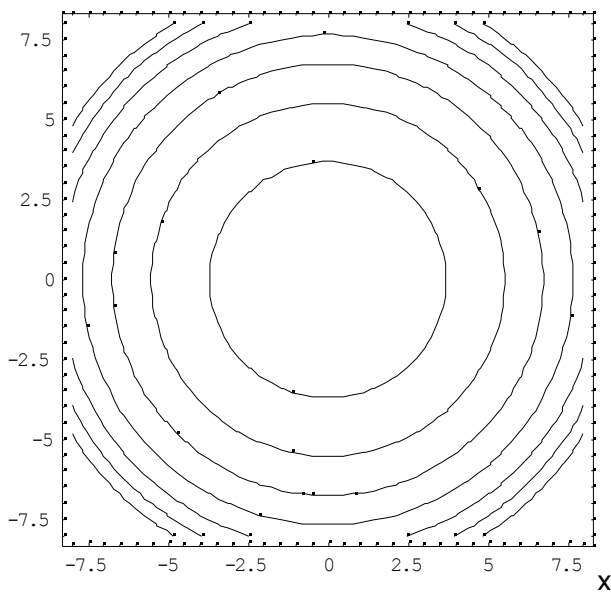
**FIGURE FOR FIRST PAGE:**



Temperature along a wall of a heated room

**SOLUTIONS (TO PAGE 2)**

1.  $y$



2.  $y$

