

Contour Map and 3D Model Project

Preliminary questions:

1. Make a contour map of $f(x, y) = x - y$, for $c=0, 5, 10, 15, 20, 25$. Make sure the z values are labeled and it is scaled accurately.
2. Given the function, $f(x) = x^3 - y^3$, graph the cross – section with y fixed. Let $y = \{-3, -2, -1, 0, 1, 2, 3\}$
3. Make a 3-d sketch of $f(x) = x^2 + 2$. Describe this shape in a sentence.

Project: This project is graded as a major group quiz. It is due a week from the start date.

The temperature T (in $^{\circ}\text{C}$) at any point in the region $-5 \leq x \leq 5$, $-5 \leq y \leq 5$ (neither x nor y can equal zero) is given by the function $T(x, y) = \frac{200}{x^2 y^2}$.

1. Sketch a cross section for $y=1$ and $y=2$. Explain in a few sentences what information is learned from the cross section
2. Sketch isothermal curves (curves of constant temperature) for $T = 5^{\circ}\text{C}$, $T = 35^{\circ}\text{C}$, $T = 65^{\circ}\text{C}$, $T = 95^{\circ}\text{C}$, $T = 125^{\circ}\text{C}$, $T = 155^{\circ}\text{C}$, and $T = 185^{\circ}\text{C}$.
3. Use the cardboard to create a 3-d model of the temperature function. This model should have accurate dimensions and be visually appealing. The model should be large, and the contour levels should be obvious.
4. If a heat-seeking bug is put down at the point $(1,2)$ on the temperature curve, in which direction should the bug travel to get warmer. Indicate this on your 3-d model by drawing an x for the bug and an arrow for the direction of travel.
5. As x and y both approach infinity, the contour lines start getting infinitely close together. Explain this. In this explanation, also explain why x and y cannot equal zero.

Presentation of the project:

The graphs from 1 and 2 should be neatly drawn and inconspicuously taped to the outer edge of the model (question 3).

Question 4 should be drawn on the model. Then, on the outer edge of the model, write a sentence explaining your answer.

Question 5 should be typed and inconspicuously taped to the outer edge of the model (question 3).