

Due October 28

Name

Directions: Be sure to follow the guidelines for writing up projects as specified in the course information sheet (passed out on the first day of class). Whenever appropriate, use in-line citations, including page numbers and people consulted when you present information obtained from discussion, a text, notes, or technology. **Only write on one side of each page.**

“Mathematics is the language with which God has written the universe” -Galileo Galilei, physicist and astronomer (1564-1642)

Project Description

Do one (1) of the following. The second problem is “computational” but involves material we won’t cover until Friday or Monday.

1. Let $T(x, y) = 1 - x^2 - 2y^2$ be the temperature at each point $P(x, y)$ in the plane. A heat-loving bug is placed in the plane at the point $P_0(-1, 1)$. Find the path, as a parametrized curve, that the bug should take to stay as warm as possible. [Hint: At each point on the bug’s path, the tangent direction will point in the direction for which T increases most rapidly and assume the bug travels at a velocity proportional to the rate at which the temperature is increasing.]
2. Do both of the following.
 - (a) Find the volume of the largest rectangular box with edges parallel to the x -, y - and z -axes that can be inscribed in the ellipsoid $4x^2 + 36y^2 + 9z^2 = 36$.
 - (b) Use the fact that 12 fluid ounces is approximately 6.89π cubic inches to find the dimensions of the 12-oz soda can that can be constructed using the least amount of metal. Compare your answer with an actual can of Pepsi. Why do you think Pepsi builds their cans with these dimensions?