Florida SouthWestern State College

General Education Assessment

CREATIVE Competency: EVALUATE

Exemplar Assignment from Dr. Magomo, Professor of Mathematics Submission from Calculus III (MAC 2313)

Application of Partial Derivatives

Summary and Objective of the Assignment

One of the interesting examples of application of partial derivatives in Calculus III (MAC 2313) is determining directional derivative and gradient of a function in space. Students are not only expected to evaluate the directional derivative at a point, or finding the gradient vector at a given point, but a combination of these concepts become useful applications in real life.

This example presents an opportunity for students to comprehend, interpret and apply their knowledge and usefulness of the concepts under study. A follow up discussion presents opportunities for students to share examples such as heat-seeking missile, steepest descend problems or temperature variations on an alloy

Assignment Question

After a wild car chase by the police on a stolen vehicle, out of abundance of caution, the police followed this reckless driver from a distance only to then lose sight of the car, and then later find it abandoned by the roadside near a thick jungle. It was obvious the thief was hiding somewhere in the dense bush. The police helicopter contacted the Met Department who gave them the temperature function of the region defined by T(x,y,z)=80/(1+x^2+2y^2+3z^2), where T is measured in degrees Celsius and x, y and z are in meters. By locating the coordinates of the abandoned car (1,1,2), they were able to use knowledge of direction of maximum temperature increase and locate the suspect.

Students are expected to determine the gradient vector at the point and therefore interpret that as the direction of maximum increase of temperature, caused by the runaway suspect. They are also expected to evaluate the maximum rate of increase of temperature which is the directional derivative.